



ಕರ್ನಾಟಕ ಸರ್ಕಾರ
ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಇಲಾಖೆ

ಸಂಖ್ಯೆ: ತಾಂಶಿನಿ 36 ಸಿಡಿಪಿ(1) 2017-18

36

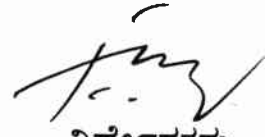
ನಿರ್ದೇಶಕರ ಕಾರ್ಯಾಲಯ
ಅರಮನೆ ರಸ್ತೆ, ಬೆಂಗಳೂರು-560 001.
ದಿನಾಂಕ: 04-04-2018.

:ಸುತ್ತೋಲೆ:

ವಿಷಯ: 2018ರ ಸಾಲಿನಿಂದ ಡಿಪ್ಲೊಮಾ ಅಭ್ಯರ್ಥಿಗಳು ಬಿ.ಇ (ಲ್ಯಾಟರಲ್ ಎಂಟ್ರಿ) ವ್ಯಾಸಂಗಕ್ಕೆ ಪ್ರವೇಶ ಪಡೆಯಲು ಕರ್ನಾಟಕ ಪರೀಕ್ಷಾ ಪ್ರಾಧಿಕಾರ ನಡೆಸುವ DCET ಪರೀಕ್ಷೆಗಳಿಗೆ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಅಳವಡಿಸಿರುವ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ: ಸರ್ಕಾರದ ಆದೇಶ ಸಂ. ಇಡಿ 23 ಟಿಪಿಇ 2018, ಬೆಂಗಳೂರು, ದಿನಾಂಕ:03ನೇ ಎಪ್ರಿಲ್ 2018.

ಜುಲೈ 2018 ರಿಂದ ನಡೆಯುವ DCET ಪರೀಕ್ಷೆಗಳಿಗೆ ಹಾಜರಾಗಿ ಬಿ.ಇ (ಲ್ಯಾಟರಲ್ ಎಂಟ್ರಿ) ಪ್ರವೇಶ ಪಡೆಯುವ ಅಭ್ಯರ್ಥಿಗಳು “ಫಲಿತಾಂಶದ ಆಧಾರಿತ ಪಠ್ಯಕ್ರಮ (Outcome Based Education)” ಪದ್ಧತಿಯನುಸಾರ, ಸರ್ಕಾರವು ಪ್ರಕಟಿಸಿರುವ ಪಠ್ಯಕ್ರಮಗಳಂತೆ DCET ಪರೀಕ್ಷೆಗಳನ್ನು ತೆಗೆದುಕೊಳ್ಳುವುದು. ಸದರಿ ಮಾಹಿತಿಯನ್ನು ಸಂಸ್ಥೆಯ ಸೂಚನಾ ಫಲಕದಲ್ಲಿ ಪ್ರಕಟಿಸುವ ಮುಖಾಂತರ ಸಂಬಂಧಪಟ್ಟ ಎಲ್ಲಾ ವಿದ್ಯಾರ್ಥಿಗಳ ಗಮನಕ್ಕೆ ತರಲು ಸೂಚಿಸಲಾಗಿದೆ.


ನಿರ್ದೇಶಕರು
04/04/18

ಗೆ:

ರಾಜ್ಯದ ಎಲ್ಲಾ ಸರ್ಕಾರಿ, ಅನುದಾನಿತ ಮತ್ತು ಖಾಸಗಿ ಪಾಲಿಟೆಕ್ನಿಕ್‌ಗಳ ಪ್ರಾಂಶುಪಾಲರುಗಳಿಗೆ
- ಸೂಕ್ತ ಕ್ರಮಕ್ಕಾಗಿ.

ಪ್ರತಿ:

1. ಕಾರ್ಯನಿರ್ವಾಹಕ ನಿರ್ದೇಶಕರು, ಕರ್ನಾಟಕ ಪರೀಕ್ಷಾ ಪ್ರಾಧಿಕಾರ, ಮಲ್ಲೇಶ್ವರಂ, ಬೆಂಗಳೂರು-ಸೂಕ್ತ ಕ್ರಮಕ್ಕಾಗಿ.
2. ಕಾರ್ಯದರ್ಶಿ, ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಪರೀಕ್ಷಾ ಮಂಡಳಿ, ಬೆಂಗಳೂರು-ಸೂಕ್ತ ಕ್ರಮಕ್ಕಾಗಿ.
3. ಸಹಾಯಕ ನಿರ್ದೇಶಕರು(ಎ.ಸಿಎಂ), ತಾಂ.ಶಿ.ನಿ, ಬೆಂಗಳೂರು-ಸೂಕ್ತ ಕ್ರಮಕ್ಕಾಗಿ.
4. ಇ-ಗೌವರ್ನೆನ್ಸ್ ವಿಭಾಗ- ವೆಬ್ ಸೈಟ್‌ನಲ್ಲಿ ಪ್ರಕಟಿಸಲು.

ಅಡಕಗಳು: ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ನಡವಳಿಗಳು ಮತ್ತು ಅನುಮೋದಿತ DCET ಪಠ್ಯಕ್ರಮಗಳ ಪ್ರತಿ.

(14) 04/4/18

ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ನಡವಳಿಗಳು

ವಿಷಯ:- 2018ರ ಸಾಲಿನಿಂದ ಡಿಪ್ಲೋಮಾ ಅಭ್ಯರ್ಥಿಗಳು ಬಿ.ಇ (ಲ್ಯಾಟರಲ್ ಎಂಟ್ರಿ) ವ್ಯಾಸಂಗಕ್ಕೆ ಪ್ರವೇಶ ಪಡೆಯಲು ಕರ್ನಾಟಕ ಪರೀಕ್ಷಾ ಪ್ರಾಧಿಕಾರ ನಡೆಸುವ DCET ಪರೀಕ್ಷೆಗಳಿಗೆ ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಅಳವಡಿಸುವ ಬಗ್ಗೆ.

ಓದಲಾಗಿದೆ:-

1. ಸರ್ಕಾರದ ಪತ್ರ ಸಂಖ್ಯೆ: ಇಡಿ 281 ಟಿಪಿಇ 2013, ದಿನಾಂಕ:13-02-2015.
2. ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 148 ಟಿಪಿಇ 2015, ದಿನಾಂಕ:23-06-2016.
3. ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 76 ಟಿಪಿಇ 2016, ದಿನಾಂಕ:21-06-2016.
4. ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 46 ಟಿಪಿಇ 2017, ದಿನಾಂಕ:15-05-2017.
5. ನಿರ್ದೇಶಕರು, ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಪತ್ರ ಸಂಖ್ಯೆ: ತಾಂಶಿನಿ 36 ಸಿಡಿಪಿ (1) 2017-18/2910, ದಿನಾಂಕ:30-01-2018.

ಪ್ರಸ್ತಾವನೆ:-

ಮೇಲೆ ಕ್ರಮಸಂಖ್ಯೆ (1) ರಲ್ಲಿ ಓದಲಾದ ಸರ್ಕಾರದ ಪತ್ರದಲ್ಲಿ ರಾಜ್ಯದ ಪಾಲಿಟೆಕ್ನಿಕ್‌ಗಳ ಡಿಪ್ಲೋಮಾ ಕೋರ್ಸುಗಳ ಪಠ್ಯಕ್ರಮವನ್ನು ಕೆಲವೊಂದು ಷರತ್ತಿಗೊಳಪಡಿಸಿ ಪರಿಷ್ಕರಿಸಲು ಸರ್ಕಾರದ ಅನುಮೋದನೆ ನೀಡಲಾಗಿರುತ್ತದೆ.

ಮೇಲೆ ಕ್ರಮಸಂಖ್ಯೆ (2), (3) ಮತ್ತು (4)ರಲ್ಲಿ ಓದಲಾದ ಸರ್ಕಾರದ ಆದೇಶಗಳಲ್ಲಿ ರಾಜ್ಯದಲ್ಲಿನ ಎಲ್ಲಾ ಪಾಲಿಟೆಕ್ನಿಕ್‌ಗಳ ಡಿಪ್ಲೋಮಾ ಕೋರ್ಸುಗಳಲ್ಲಿ ಕ್ರಮವಾಗಿ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು 2015-16ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ, 3 ಮತ್ತು 4ನೇ ಸೆಮಿಸ್ಟರ್‌ನ ಪಠ್ಯಕ್ರಮವನ್ನು 2016-17ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಹಾಗೂ 5 ಮತ್ತು 6 ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಲ್ಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು 2017-18ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಪರಿಷ್ಕೃತ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಲು ಅನುಮೋದನೆ ನೀಡಲಾಗಿತ್ತು.

ಮೇಲೆ ಕ್ರಮಸಂಖ್ಯೆ (5)ರಲ್ಲಿ ಓದಲಾದ ನಿರ್ದೇಶಕರು, ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಇಲಾಖೆ ರವರ ಪತ್ರದಲ್ಲಿ ರಾಜ್ಯದ ಪಾಲಿಟೆಕ್ನಿಕ್ ಡಿಪ್ಲೋಮಾ ಸೆಮಿಸ್ಟರ್‌ಗಳ ಪಠ್ಯಕ್ರಮಗಳಲ್ಲಿ " ಫಲತಾಂಶದ ಆಧಾರಿತ ಪಠ್ಯಕ್ರಮ (Outcome Based Education)" ಪದ್ಧತಿಯನುಸಾರ ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳನ್ನು 2015-16ನೇ ಸಾಲಿನಿಂದ ಅಳವಡಿಸಲಾಗಿದ್ದು, ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳ ಪ್ರಕಾರ ಪ್ರವೇಶ ಪಡೆದ ಡಿಪ್ಲೋಮಾ ವಿದ್ಯಾರ್ಥಿಗಳು 2018ನೇ ಸಾಲಿನಲ್ಲಿ ಡಿಪ್ಲೋಮಾ ವ್ಯಾಸಂಗವನ್ನು ಮುಗಿಸಲಿದ್ದು, ಆಸಕ್ತ ಅರ್ಹ ಡಿಪ್ಲೋಮಾ ಅಭ್ಯರ್ಥಿಗಳು ಬಿ.ಇ (ಲ್ಯಾಟರಲ್ ಎಂಟ್ರಿ) ವ್ಯಾಸಂಗ ಮುಂದುವರಿಸಲು, ಕರ್ನಾಟಕ ಪರೀಕ್ಷಾ ಪ್ರಾಧಿಕಾರ ನಡೆಸುವ 2018ರ ಸಾಲಿನ DCET ಪರೀಕ್ಷೆಗಳನ್ನು ತೆಗೆದುಕೊಳ್ಳಬೇಕಾಗಿರುತ್ತದೆ. ಆದ್ದರಿಂದ 2018ರ ಸಾಲಿನ ಡಿಪಿಇಟಿ ಪರೀಕ್ಷೆಗಳಿಗೆ 2015-16ನೇ ಸಾಲಿನಿಂದ ಡಿಪ್ಲೋಮಾ ವ್ಯಾಸಂಗದಲ್ಲಿ ಅಳವಡಿಸಿರುವ "ಫಲತಾಂಶದ ಆಧಾರಿತ ಪಠ್ಯಕ್ರಮ (Outcome Based Education)" ಪದ್ಧತಿಯ ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಅಳವಡಿಸಬೇಕಾಗಿರುತ್ತದೆ.

ಅದರಂತೆ, ವಿವಿಧ ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಪರಿಣಿತರ, ವಿವಿಧ ಔದ್ಯೋಗಿಕ ಕ್ಷೇತ್ರಗಳ ತಾಂತ್ರಿಕ ಪರಿಣಿತರು ಹಾಗೂ ರಾಷ್ಟ್ರೀಯ ತಾಂತ್ರಿಕ ಶಿಕ್ಷಕರ ತರಬೇತಿ ಮತ್ತು ಸಂಶೋಧನಾ ಸಂಸ್ಥೆ, ಬೆಂಗಳೂರು ಇವರೊಳಗೊಂಡ ಪಠ್ಯಕ್ರಮ ಪರಿಷ್ಕರಣಾ ಸಮಿತಿಯನ್ನು ರಚಿಸಿದ್ದು, ಸದರಿ ಸಮಿತಿಯು ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳಲ್ಲಿ ವಿಧ್ಯಾರ್ಥಿಗಳು ಕಲಿತಿರುವ ತಾಂತ್ರಿಕ/ಪಠ್ಯಕ್ರಮವನ್ನು ಪರಿಗಣಿಸಿ, 2018ರ ಸಾಲಿನಿಂದ ನಡೆಯುವ ಡಿಸಿಇಟಿ ಪರೀಕ್ಷೆಗಳಲ್ಲಿ ಅಳವಡಿಸಲು, ಈ ಕೆಳಗಿನಂತೆ ಹೊಸ ಪಠ್ಯಕ್ರಮವನ್ನು ಸಿದ್ಧಪಡಿಸಿದ್ದು, ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು 2018ನೇ ಸಾಲಿನಿಂದ ನಡೆಸುವ ಡಿಸಿಇಟಿ ಪರೀಕ್ಷೆಗಳಿಗೆ ಅಳವಡಿಸಲು ಸರ್ಕಾರದ ಅನುಮೋದನೆ ನೀಡುವಂತೆ ಮತ್ತು ಕರ್ನಾಟಕ ಪರೀಕ್ಷಾ ಪ್ರಾಧಿಕಾರಕ್ಕೆ ಸೂಚಿಸುವಂತೆ ಪ್ರಸ್ತಾವನೆಯನ್ನು ಸಲ್ಲಿಸಿರುತ್ತಾರೆ.

ಪರೀಕ್ಷಾ ವಿಧಾನ : ಬಹು ಆಯ್ಕೆ ಪ್ರಶ್ನೆಗಳು.
ಪರೀಕ್ಷೆ ಸಮಯ: 3 ಗಂಟೆಗಳು (180 ನಿಮಿಷಗಳು)
ಗರಿಷ್ಠ ಅಂಕಗಳು: 180

ಅಂಕಗಳ ವಿಂಗಡನೆ:

ಎ) ಸಂಬಂಧಿಸಿದ ಇಂಜಿನಿಯರಿಂಗ್ ವಿಷಯಗಳು : 100 ಅಂಕಗಳು.
ಬಿ) ಗಣಿತ ಮತ್ತು ವಿಜ್ಞಾನ ವಿಷಯಗಳು : 80 ಅಂಕಗಳು
(ಗಣಿತದಲ್ಲ 40 ಅಂಕಗಳು ಹಾಗೂ ವಿಜ್ಞಾನದಲ್ಲ 40 ಅಂಕಗಳು)

ಸದರಿ ಪ್ರಸ್ತಾವನೆಯನ್ನು ಕೂಲಂಕಷವಾಗಿ ಪರಿಶೀಲಿಸಿ, ಈ ಕೆಳಕಂಡಂತೆ ಆದೇಶಿಸಿದೆ.

ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 23 ಟಿಐಇ 2018.

ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 03ನೇ ಏಪ್ರಿಲ್ 2018.

ಪ್ರಸ್ತಾವನೆಯಲ್ಲಿ ವಿವರಿಸಿರುವ ಅಂಶಗಳ ಹಿನ್ನೆಲೆಯಲ್ಲಿ, ಸರ್ಕಾರವು, 2018ನೇ ಸಾಲಿನಿಂದ ಡಿಪ್ಲೊಮಾ ಅಭ್ಯರ್ಥಿಗಳು ಬಿ.ಇ (ಲ್ಯಾಟರಲ್ ಎಂಟ್ರಿ) ವ್ಯಾಸಂಗಕ್ಕೆ ಪ್ರವೇಶ ಪಡೆಯಲು ಕರ್ನಾಟಕ ಪರೀಕ್ಷಾ ಪ್ರಾಧಿಕಾರ ನಡೆಸುವ DCET ಪ್ರವೇಶ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಫಲಿತಾಂಶದ ಆಧಾರಿತ ಪಠ್ಯಕ್ರಮ (Outcome Based Education)" ಪದ್ಧತಿಯನುಸಾರ ಅನುಬಂಧ- 1 ರಿಂದ 11 ರಲ್ಲರುವಂತೆ ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಅಳವಡಿಸಿಕೊಂಡು Diploma CET ಪ್ರವೇಶ ಪರೀಕ್ಷೆಗಳನ್ನು ನಡೆಸಲು ಅನುಮೋದನೆ ನೀಡಿ ಆದೇಶಿಸಲಾಗಿದೆ.

ಕರ್ನಾಟಕ ರಾಜ್ಯಪಾಲರ ಆದೇಶಾನುಸಾರ
ಮತ್ತು ಅವರ ಹೆಸರಿನಲ್ಲಿ,



(ಎಸ್.ವೆಂಕಟೇಶ್)

ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿ,

ಶಿಕ್ಷಣ ಇಲಾಖೆ (ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ).

ಪ್ರತಿ:-

1. ಪ್ರಧಾನ ಮಹಾಲೇಖಪಾಲರು(ಜಿ&ಎಸ್‌ಎಸ್‌ಎ) & (ಇ&ಆರ್‌ಎಸ್‌ಎ)ರವರ ಕಾರ್ಯದರ್ಶಿ, ಕರ್ನಾಟಕ, ಹೊಸ ಕಟ್ಟಡ, ಆಡಿಟ್ ಭವನ, ಅಂಚೆ ಪೆಟ್ಟಿಗೆ ಸಂಖ್ಯೆ 5398,ಬೆಂಗಳೂರು- 560 001.

2. ಪ್ರಧಾನ ಮಹಾಲೇಖಪಾಲರು (ಎ&ಇ) ರವರ ಕಾರ್ಯದರ್ಶಿ, ಕರ್ನಾಟಕ, ಪಾರ್ಕ್ ಹೌಸ್ ರಸ್ತೆ, ಅಂಚೆ ಪೆಟ್ಟಿಗೆ ಸಂಖ್ಯೆ 5329, ಬೆಂಗಳೂರು - 560 001.
3. ಕಾರ್ಯನಿರ್ವಾಹಕ ನಿರ್ದೇಶಕರು, ಕರ್ನಾಟಕ ಪರೀಕ್ಷಾ ಪ್ರಾಧಿಕಾರ, ಮಲ್ಲೇಶ್ವರಂ, ಬೆಂಗಳೂರು.
4. ನಿರ್ದೇಶಕರು, ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ಬೆಂಗಳೂರು
5. ಕಾರ್ಯದರ್ಶಿ, ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಪರೀಕ್ಷಾ ಮಂಡಳಿ, ಬೆಂಗಳೂರು.
6. ಸರ್ಕಾರಿ, ಅನುದಾನಿತ ಮತ್ತು ಖಾಸಗಿ ಪಾಲಿಟೆಕ್ನಿಕ್‌ಗಳ ಪ್ರಾಂಶುಪಾಲರಿಗೆ (ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ನಿರ್ದೇಶಕರ ಮುಖಾಂತರ)
7. ಶಾಖಾ ರಕ್ಷಾ ಕಡತ / ಹೆಚ್ಚಿನ ಪ್ರತಿ / ಒಡಿಜಿಸಿ



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INDEX

LIST OF DCET CURRICULUM- PROGRAMME WISE

Sl.No	Programme Name	Group Code	Total Marks
1	Textile Technology	TX	100
2	Mechanical Engineering & Allied	ME	100
3	Environmental, PHE and WT&HS	EN	100
4	Electronics and Communications Engg.	EC	100
5	Electrical and Electronics Engg.	EE	100
6	Computer Science and Engineering	CS	100
7	Civil Engineering and Allied	CE	100
8	Chemical Engineering & Polymer Engineering	CH	100
9	Aeronautical Engineering	AE	100
10	Mining Engineering	MN	100
11	Engineering Mathematics(40Marks) and Applied Science (40Marks) [Common to All Programmes]		80


DCET Total Marks: 180

Maximum Marks: 180

Test Duration: 3Hours

Subjects	Marks	Remarks
Engineering Mathematics	40	Common to all Branches
Applied Science	40	Common to all Branches
Textile Technology/ Mechanical Engineering & Allied/ Environmental, PHE and WT&HS/ Electronics and Communications Engg./ Electrical and Electronics Engg./ Computer Science and Engineering/ Civil Engineering and Allied/ Chemical Engineering/ Aeronautical Engineering/ Polymer Engineering/ Mining Engineering	100	Separate Question Paper for all the Engineering Subjects as per the group to which they belong.

Number of Questions: 180 (Multiple Choice)


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ANNEXURE-I

TEXTILE TECHNOLOGY

Total Marks.100

1. TEXTILE FIBRE TECHNOLOGY: 13 Marks

Classification of textile fibers, polymerization, Natural fibers: cotton, wool, silk, bast fibers, Manmade fibers: Viscose rayon, Acetate rayon, Nylon 6, Nylon 66, Polyester, Acrylic. High performance fibers: Carbon, Kevlar, Nomex and teflon.

2. YARN MANUFACTURE: 13 Marks

Ginning, opening, cleaning, mixing and blending. Modern developments in blow room. Carding, drawing, combing, roving, Ring Spinning, Rotor spinning, Friction spinning, Air jet spinning, doubling, Spinning calculations.

3. FABRIC MANUFACTURE AND FABRIC STRUCTURE: 17 Marks

Preparatory process- Warp and weft winding, warping, sizing, shedding- Tappet, dobby and jacquard, picking, beat up, let off, take up, weft and warp protector mechanisms. Automatic looms, box motions, and shuttleless looms. Elements of structure, Simple weaves- plain and its derivatives, twill and its derivatives, satin and sateen. Honey comb, huckaback, mock leno, bed ford cord, pique, distorted thread effects.

4. CHEMICAL PROCESSING OF TEXTILES: 17 Marks

Water purification, preparatory process- Singeing, Desizing, bleaching, mercerization, degumming, dyeing- theories, acid dyes, basic dyes, direct dyes, reactive dyes, vat dyes, azoic dyes, sulfur dyes, metal complex dyes, disperse dyes and their applications. Printing- Methods, styles, printing paste ingredients and curing. Finishing- Mechanical finishes and chemical finishes. Pollution control and Effluent treatment. Eco-labelling and ecoprocessing.

5. TEXTILE TESTING: 17 Marks

Fiber testing:- Sampling, moisture relations, Fibre dimensions, strength. Yarn testing-Yarn count, twist, irregularity, and strength. Fabric testing-Dimensions, strength, fabric handle and drape, water and air permeability, thermal comfort, crease and wrinkle recovery, serviceability, and fastness. Statistical quality control-central tendency measures, dispersion measures, probability distributions, significance tests and control charts.

6. KNITTING AND APPAREL MANUFACTURE: 13 Marks

Knitting: - weft knitting- elements, machines and structures. Warp knitting- Tricot and Rachel machines. Calculations related to Knitting.

Apparel Manufacture: Fashion designing, Fabric sourcing, pattern making, spreading, cutting, sewing, fusing, pressing, packing, merchandising, Industrial engineering, apparel testing and QC.

7. PROFESSIONAL ETHICS AND MANAGEMENT:

10 Marks

Professional ethics: - Morale and Integrity, engineering ethics, safety and responsibilities, human rights.

Management: - Principles, Functions, Planning, types of organization, Leadership, Motivation: Interpersonal skills and Communication, Recruitment and training, wages and incentives, TQM, Preventive maintenance and Industrial safety, Eco standards and Eco management



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ANNEXURE-II
MECHANICAL ENGINEERING

Total Marks: 100

1. Manufacturing Technology:

25 Marks

Lathe -Construction- Various Operations- Taper Turning Methods- Lathe Attachments & Accessories- Capstan and Turret Lathes – Automats – Single Spindle- Swiss Type- Multi Spindle Automatic lathe.

Theory Of Metal Cutting- Chip Formation, Orthogonal Cutting- Oblique Cutting- Cutting Tools-Single point Cutting Tool Geometry-Cutting Tool Materials, Tool Wear, Tool Life, and Cutting Fluids-Functions and properties.

Drilling - operations- Twist drill geometry –Radial drilling machine.

Milling-Classification - Milling cutters and classification-Fundamentals of milling processes- Milling operations. Indexing methods-Simple and compounding. Cutting speed, feed, depth of cut and machining time.

Shaping- Various shaper operations- Planer -Principal parts and Various planer operations

Grinding- Abrasive Processes- Grinding Wheel – Specifications And Selection, Types Of Grinding Process – Cylindrical Grinding, Surface Grinding, Centre less Grinding–Super finishing process- Honing, Lapping, Super Finishing, Polishing And Buffing.

Unconventional Machining Process - Electron Beam Machining, Laser Beam Machining, Electric Discharge Machining, Ultrasonic Machining, Abrasive Jet Machining.

Casting- Moulding Sands- Patterns- Casting Processes- Special Casting Techniques.

Welding Techniques: basic working principles of -Arc Welding- Gas Welding- TIG- MIG- Resistance Welding.

Rolling-Hot and cold rolling- Sheet Metal Operation-Shearing, Blanking, Punching, Trimming, Drawing, Embossing- Powder metallurgy.

CNC part programming- Structure of part programme- -Preparatory function (G)- Miscellaneous function(M).

Robotics- Structure of a robot-Applications of industrial robot.

Jigs and Fixtures- Definition-Need of Jigs and Fixtures

Basics of Drawing- Conventions- Types of lines- Dimensioning-systems of dimensioning - Surface finish symbols.

2. Strength of Materials and Theory of Machines:

17 marks

Simple stresses & strains: viz. tensile, compressive, Shear, & corresponding strains, Hook's Law – factor of Safety. Elastic Constants - Lateral Strain, Poisson's ratio, Bulk Modulus, Shear Modulus, Rigidity modulus. (Simple problems only on stress and strain, young's modulus).

Centre of Gravity & Moment of Inertia : its Importance -Parallel & Perpendicular Axis Theorem-C.G of Rectangle, Triangle, Circle, Semi-circle, Trapezium, Cone(Only formulae)- Moment of Inertia of solid & Hollow sections like Rectangle, Triangle, Circle. (Only formulae).

Shear Force and Bending Moment: Definition -Types of beams, types of load acting on beams-Concept of Maximum bending moment- Drawing S.F & B.M Diagram for Cantilever, Simply Supported Beams subjected to Point Load and U.D.L (No problems)

Torsion & bending :Introduction - Angle of Twist - Polar Moment of Inertia - Torsion equation- Assumptions in theory of Torsion -Power Transmitted by a shaft. (No problems)

Bending- Introduction, assumptions in theory of simple bending.-Bending stress. (No problems)

Basic Kinematics of Machines- Four bar chain-mechanism and inversion.

Transmission of power: Introduction to Belt Drives-types of flat belt drives-open& cross-idler pulley- cone pulley- fast and loose pulley. Velocity Ratio- Slip and creep of belt. Rope drive-applications- Chain drives-types- advantages-Gear drives- Classification of Gears- applications of different gears. Gear Trains-Types of Gear trains –Simple, Compound, Reverted and Epicyclic gear trains- applications (Only problems on velocity ratio of belts and gears).

Friction-Introduction-Types of Friction, Laws of solid friction, coefficient of friction, limiting angle of friction, angle of Repose. (No problems)

3. Thermal Engineering:

17 MARKS

Thermodynamic systems – closed, open and isolated systems with examples-Properties of system- Intensive and Extensive properties with examples.-Definitions for properties like Enthalpy (H), Entropy(s) Internal energy (U)- Specific heat at constant pressure(C_p), specific heat at constant volume(C_v)- characteristic gas equation, - Universal gas constant, -Law of thermodynamics-Zeroth, first & second laws of thermodynamics. (No problems).

Thermodynamic processes- Constant pressure, Constant volume, Isothermal, Isentropic, Polytropic, Free expansion and throttling-processes & equations representing the processes. (No problems).

IC engine -definition-classification- - Working principle of Two Stroke petrol & Diesel engine - Working principle of Four Stroke petrol & Diesel engine. -Rope brake Dynamometer-Formulae for Brake power, Indicated power Mechanical efficiency, Indicated thermal efficiency, Brake thermal efficiency, Mean effective pressure-Air standard efficiency, Relative efficiency, Volumetric efficiency. (Only problems on BP, IP and Mechanical efficiency).

Gas turbine-Introduction-types-open & close cycle-applications.

Formation of steam: Wet steam-dry steam-superheated steam and its properties.

Air Compressors- types-single stage & multi stage -uses-applications.

Refrigeration: Vapour compression-vapour absorption refrigeration- unit of refrigeration-COP -types of refrigerants –properties.

4. Fluid mechanics and Pneumatics:

17 MARKS

Properties of fluids-Fluid pressure-manometer-simple & Differential-Pressure gauges Types- Type of fluid flows-Bernoulli's equation-Limitations- venturi meter-orifice meter-hydraulic co-efficient-losses in pipes-Darcy's and Chezs equations-Hydraulic gradients-water hammer (No problems)

Pumps- classification of pumps – Need for priming of centrifugal pump–multistage centrifugal pump. Reciprocating pump-types- Air Vessel-Slip. Concept of Submersible pump (No problems)

Hydraulic systems- -. Components of Hydraulic systems- Vane pump, gear pump - Hydraulic Valves –Pressure control valves – pressure relief valve, Direction control valves - 3/2, 5/2 valves,-Sequence valves.-Flow control valves–Actuators- Linear Actuators – Cylinders - single acting, double acting - Hydraulic motors-Accumulators-Types.

Pneumatic system- Components of pneumatic system- working of FRL unit- Control Valves – Pressure regulating valves, Flow Control valves, Direction Control Valves.- Actuators - single acting and double acting - Air motors,- Pneumatic Symbols.

5. Management:

12 Marks

Management-Henry Fayol's principles-organization types- Production and Productivity- Product Design and its Stages- Types of Production- Functions of Production- Planning and Control Department- Purchasing and its Procedure- methods of purchasing - Comparative statement-purchase order-Tender-Types of tender

Storekeeping- classification of stores - Functions of store keeper -Bin Card - Material Issue Requisition- Material Returned Note- Store ledgers . Inventory Management- Definition - functions of Inventory Control

Material Requirement Planning (MRP)-concept, applications -Just in Time (JIT)-concept benefits –FIFO(first in first out) concept-advantages.

Motivation-Leader and types-Logistics- Quality- Factors affecting quality Inspection-Types.

Total Quality Management-Meaning- Principles of total quality management-PDCA cycles-Quality Circles-definition-Function.

TQM Tools- Flow charts, Control charts, Histograms, Pareto charts, Cause and effect diagram-5-S- Kaizen, and Six-sigma

Quality Certification Systems- ISO 9000 series quality standards, QS14000– ISO 9000, ISO 9001,ISO9002,ISO9003 & ISO 9004- ISO9000 quality certification procedure.

Plant maintenance-Definition-Types of maintenance-Preventive maintenance- Break down maintenance.

Industrial safety –Meaning - Accident- causes for accident- Direct and indirect losses due to an accident- Safety department- role of safety officer

Environment - Definition and scope-Solid waste management- causes, effects and control measures of municipal solid wastes (hospital wastes, hazardous wastes and e-wastes)- Water conservation and rain water harvesting. Climate change- global warming, acid rain, ozone layer depletion

6.Material science and Measurements;

12 MARKS

Mechanical Properties: Mechanical properties of metals, properties and Uses of Pig Iron, Cast Iron , Steel, Copper, Aluminum, Lead, Zinc, Tin-Nickel and Iron.

Heat Treatment: Heat Treatment of Steel, Properties & Uses of Plastic, Ceramics, and Composite materials.

Measurements-methods-terms applicable to measuring instruments-Thread measurements- sine bar-plug gauges-ring gauges. Transducer- strain gauges-types-Proving ring-load cells- Tachometers-LVDT-optical-pyrometer-thermocouple-Hydrometer-density measurement- Hygrometer-liquid level sensors.

Interchangeability-limits and tolerance-fit and its classifications-system of fits-unilateral and bilateral system

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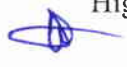
Sl. No	Contents	Reference Books
1	Manufacturing Technology	<ol style="list-style-type: none"> 1. Rao, P.N., <i>Manufacturing Technology, Vol I & II</i>, Tata Mcgraw Hill Publishing Co., New Delhi, 1998 2. Seropekalpakjian, Steven R Schmid <i>Manufacturing Engineering and Technology</i>- Pearson Education-Delhi 3. Sharma, P.C., <i>A Textbook Of Production Technology – Vol I And II</i>, S. Chand & Company Ltd., New Delhi, 1996 4. HMT – “<i>Production Technology</i>”, Tata Mcgraw-Hill, 1998 5. <i>Elements of Workshop Technology Vol-I&II Manufacturing Process edition</i>-By Hajra Choudry 6. K.R.Gopalakrishna “<i>Engineering Drawing</i>” (Vol. I & II). Subhas Publications, 2014
2	Strength of Materials and Theory of Machines	<ol style="list-style-type: none"> 1. Ramamurtham. S., “<i>Strength of Materials</i>”, 14th Edition, Dhanpat Rai Publications, 2011 2. Khurmi R S, “<i>Applied Mechanics and Strength of Materials</i>”, 5 Edition, S.Chandand company 3. Popov E.P, “<i>Engineering Mechanics of Solids</i>”. 2nd Edition, Prentice-Hall of India, New Delhi, 2002. 4. Nash W.A, “<i>Theory and problems in Strength of Materials</i>”, Schaum Outline Series, McGraw-Hill Book Co., New York, 1995. 5. Kazimi S.M.A, “<i>Solid Mechanics</i>”, Tata McGraw-Hill Publishing Co., New Delhi, 2003. 6. Ryder G.H, “<i>Strength of Materials</i>”, 3rd Edition, Macmillan India Limited, 2002. 7. Bansal R. K, “<i>Strength of Materials</i>”, Laxmi Publications, New Delhi, 2012. 8. Timoshenko S.P, “<i>Elements of Strength of Materials</i>”, Tata McGraw-Hill, Delhi,
3	Thermal Engineering	<ol style="list-style-type: none"> 1. A Text book of Thermal Engineering by R S Khurmi& J K Gupta S Chand publication 2. Thermal Engineering by P. L. Ballaney, Khanna. Publishers 3. Thermal Engineering by R K Rajput, Laxmi. Publications
4	Fluid mechanics and Pneumatics	<ol style="list-style-type: none"> 1. Bansal. R.K., “<i>Fluid Mechanics and Hydraulics Machines</i>”, 9th Edition, Laxmi Publications Private Limited, New Delhi. 2011. 2. R.S.Khurmi, “<i>Fluid Mechanics and Machinery</i>”, S.Chand and Company, 2nd Edition, 2007. 3. <i>Hydraulics & Pneumatics</i> – Andrew Parr, Jaico Publishing House New Delhi. 4. <i>Hydraulic and Pneumatic Controls Understanding Made Easy</i>-K.S.Sundaram,-S.chand Company Delhi

5	Management	<ol style="list-style-type: none">1. Industrial Organization and Engineering Economics T.R.Banga & S C Sharma2. Khanna Publishers3. Industrial management and organizational behavior K.K.Ahuja4. Industrial management and engineering economics O.P.khanna Khanna publishers5. Production and operations management -Dr .K.Aswathappa and Dr.Sreedhar Bhatt Himalaya publishers6. Safety Management in Industry Krishnan.N V Jaico Publishing House, Bombay, 19977. Total Quality Management S Raja Ram, Shivashankar
6	Material science and Measurements	<ol style="list-style-type: none">1. <i>Engineering Materials</i> by Er.R.K.RAJPUT of S.CHAND Publications2. <i>Mechanical Engineering Measurement</i> - Thomas Beckwith, N.Lewis Buck, Roy Marangoni - <i>Narosa Publishing House, Bombay</i>3. <i>Mechanical Engineering Measurements</i> - A. K. Sawhney - <i>DhanpatRai& Sons, New Delhi.</i>4. "<i>Engineering Metrology</i>" by R.K.Jain, Khanna Publishers, 1994



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ANNEXURE-III

ENVIRONMENTAL ENGINEERING, PUBLIC HEALTH ENGINEERING AND WATER TECHNOLOGY & HEALTH SCIENCES

Total Marks: 100 Marks

Unit 1:-Materials of Construction, Construction Technology & Concrete Technology: - 20marks

Materials of Construction - Stones - Classification of rocks, qualities of good building stone, quarrying of stones, Bricks - Manufacturing process, types, tests, Timber - Classification, defects, preservation, seasoning, market forms of timber, Cement - Composition, types, tests, uses, Paints, varnish & distemper - Ingredients, types, Ferrous, Non-Ferrous and Alloy – Properties and Uses

Construction Technology - Types of foundation & suitability, SBC of soil, Technical terms in Brick & stone masonry, Types of damp proofing materials, types of Doors & windows, fixtures for doors & windows, Lintel & arches, Scaffolding, shoring & under pinning, Technical terms in stair, types of stairs, Types of roof, Plastering & pointing, types of floors, Ventilation.

Concrete Technology - Ingredients of concrete, Admixture, W/C ratio, Grade of concrete & steel, Curing, Special concrete, High strength concrete & steel for Pre stressing, Post tensioning, Pre tensioning.

Unit -2: Surveying & Hydraulics -20marks

Chain surveying- Types of survey, principles of survey, ranging, offsets, instruments for setting perpendiculars, errors in chain surveying.

Compass survey – Bearing, meridian, system of bearing, prismatic & surveyor compass, dip, declination, local attraction, open & closed traverse.

Leveling - Terms in leveling, Bench mark, Types of leveling, L/S, C/S, contouring computation of area, volumes, minor instruments.

Theodolite surveying – measurement of horizontal & vertical angles, deflection angle, latitude, departure, Bowditch's & Transit rule.

Trigonometric leveling – height & distance for different cases.

Tacheometry – Definition, stadia, system of Tacheometry.

Curves- Types, elements of curve, designation, setting out curves – Chord Produced and Rankin's Method

Modern survey instruments - GIS, GPS, remote sensing, Total Station – Fundamentals, Working Principles, Advantages and Disadvantages

Fundamentals – properties of fluids, total pressure, centre of pressure for circular, rectangular & triangular vertical plates.

Flow of fluids – Types of flow, Bernoulli's equation, continuity equation.

Flow through orifices, Notches and Weirs – Orifice - Types of orifice, Vena contracta, Hydraulic co-efficient & their relationships, Notches – Types of Notches, discharge over rectangle triangular & trapezoidal notches, Mouth Piece – Types, Weirs – Types of Weirs, discharge over rectangular and cippolitte weir

Flow through channels – Types, Chezy's & manning's formula, Most economical section.

Flow through pipes – Types of Major & minor losses, water hammer, surge tanks.

Unit – 3: Water Supply Engineering & Environmental Chemistry: -20marks

Hydrologic cycle and its components.

Sources of water: Surface Sources - Lakes, Streams, Rivers. Impounded Reservoirs. Underground Sources - Infiltration Galleries, Infiltration Wells and Springs.

Intake and Conveyance of water: Types of intakes, Conveyance of Water - Open Channels and Pipes, Pipe corrosion and remedial measures

Quality of Water: Impurities of water - organic and inorganic classification and examination of water. Physical - temperature, colour, turbidity, taste and odour. Chemical - pH Value, Total Solids, Hardness, Chlorides, Iron and Manganese, Fluoride and Dissolved Oxygen.

Treatment of Water: working and operation of the following units - plain sedimentation, sedimentation with coagulation, flocculation, filtration-Slow sand filters, Rapid sand filters and pressure.

Distribution System: General Requirements, Systems of Distribution - Gravity System, Combined System, Direct Pumping. Methods of Supply - Intermittent and Continuous. Distribution Systems. Storage - Underground, Ground Level And Overhead Service Reservoirs – Necessity and Accessories.

Appurtenances in Distribution System: Use of Sluice Valves, Check Valves, Air Valves, Scour Valves, Zero Velocity Valves, Fire Hydrants, Water Meter.

Introduction: chemistry fundamentals, methods of sampling gravimetric & volumetric analysis, calorimetric methods of water analysis.

Chemical equivalents: atomic structure, types of chemical bonds, equivalent weight, normal solution, normality, molarities. lecheteliers principle, common ion effect.

Colorimetric analysis: lamberts & beers law, photoelectric colorimeters, spectrophotometers, colour comparison tubes, calibration & use, flame photometers.

Absorption and adsorption: difference between absorption & adsorption, importance of adsorption in environmental engineering, use of activated carbon as an adsorbent.

Organic chemistry: BOD & COD, significance of DO, TOD & TOC.

Colloidal chemistry: meaning & size, types of colloids- lyophilic colloids & lyophobic colloids, properties of colloids,

Bio chemistry: meaning of enzymes and their importance, effect of temperature on aerobic & anaerobic bio chemical processes, effects of pH on biochemical reactions.

Surface Chemistry: definition & application of osmosis and dialysis.

Unit – 4: Sanitary Engineering & Industrial Waste Water Treatment: -20marks

Introduction: Definition of sullage, sewage, sewerage, sewer, refuse, garbage. Aims and objectives of sewerage work, systems of refuse disposal and water carriage system.

Quantity of sewage: Domestic and industrial sewage, volume of domestic sewage, variability of flow, limiting velocities-Self cleansing and Maximum velocities of sewer.

Characteristics and analysis of sewage: Strength of Sewage, Sampling of Sewage to analyze for Physical, Chemical and Biological Parameters, Decomposition of sewage, Analysis of Sewage

Sewerage systems: Types of Sewerage System and their Suitability - Separate, Combined and Partially Separate Systems, Types of Sewers - Stoneware, Cast Iron, Cement Concrete, AC Pipes, Pre-Cast Sewers, PVC sewer (SWR grade), and laying of sewers

Surface and storm water drainage: Determination of Storm Water Flow, Run-Off Co-Efficient, Time of Concentration, Empirical Formulae for Run-Off, Surface Drains - Requirements, Shapes, Laying and Construction.

Sewer appurtenances: Location, Function and Construction of Manholes, Drop Manholes, Inlets Catch Basin, Traps, Flushing Tanks, Regulators.

Sewage treatment: Preliminary Treatment - Screens Skimming Tanks and Grit Chambers, Sedimentation and Septic Tanks

Secondary Treatment - Trickling Filters Activated Sludge Process, Oxidation Ponds, Oxidation Ditches, Aerobic Lagoons, Anaerobic Lagoons, Rotary Biological Disc.

Tertiary treatment – Activated sand filter and chlorination.

Sewage Disposal - Dilution, Self purification of streams, factors affecting self purification. Disposal in Sea water, Disposal on Lands, Recycle of wastewater

Sludge treatment & Disposal - Sludge digestion tank, Sludge drying bed.

Sanitation in buildings and sanitary fittings - Importance and Requirement of Building Drainage, Sanitary Fittings- Water Closets, Flushing Cisterns, Urinals, Inspection Chambers, Traps, Anti-siphonage.

Pollutants – Classification & Sources, Characteristics of Industrial Wastewater, Characterization of waste from – Pulp & Paper mill, Pharmaceutical, Distilleries, food processing, dairy, tannery, sugar industries.

Industrial Wastewater Minimization – Volume reduction, strength reduction, Equalization, Proportioning & Neutralization. Treatment & Disposal methods of Industrial Wastewater.

Unit – 5: Air pollution monitoring and control and Environmental Sanitation: -20marks

Introduction: Air pollution, importance & composition of atmosphere, sources and classification of air pollutants.

Meteorology and air pollution: Meteorological factors influencing air pollution

Factor affecting human health: Health effects, effect of specific pollutant on human, effect of specific pollutant on animals

Effect of air pollutant on plants: Structure of normal leaf, air pollutants affecting plants, forms of damage to leaves & injury to plants, effect of specific air pollutants on plants

Economic effect of air pollution: Material damage and economical loss due to air pollution,

Control of air pollution: objectives of using control equipments settling chambers, cyclone, bag filters, electrostatic precipitator, scrubber, factors affecting choice of equipment.

smoke pollution::-sources and effects of smoke

Introduction: Definition of health and sanitation.

Communicable diseases: Definitions- epidemic, endemic, epizootic, channel of infection, Vehicle of infection, Incubation period,

Disease communicated by intestinal discharge. Typhoid fever , Hook worm disease

Disease communicated by nose and throat discharges.

Disease of animals transmitted to the human beings-Anthrax, Rabies and Brucellosis,

General method of control of communicable diseases.

Food sanitation: Importance of food sanitation, Agencies through which food may cause suffering or death. Food borne diseases; Food poisoning. Streptococcus intoxication and botulinous intoxication, Storage & protection of food in restaurant, Milk borne diseases, Essentials of milk sanitation. Health and habits of dairy workman, dairy barn, milk house, pasteurization of milk

Excreta disposal in unsewered areas: Importance, & requirements of sanitary latrine, Pit privy, Bore hole privy, Aqua privy, Concrete vault privy.

Institutional sanitation: Importance of school sanitation, School health programme, Selection site for School building, furnishing for school

Occupational hazards: Occupational hazards from various sources, General methods for protection of workers from occupational hazards, Threshold limit value , Disease caused due to inhalation of dust & their control, Disease caused due to industrial poisons, Light, heat, compressed air as occupational hazard .


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ANNEXURE-IV

ELECTRONICS & COMMUNICATION ENGINEERING

Total Marks: 100

- 1. Electrical and Electronics Engineering (08 marks):** Basics of electricity. Ohm's law. Kirchhoff's Current and Voltage law, Combination of resistances, Power, Energy. Laws of electrostatics, capacitors- dielectric, permittivity, charging and discharging of capacitors, combination of capacitors, Electromagnetic induction-Faraday's law and Lenz's law, self and mutual inductance, combination of inductors, energy stored in inductor and capacitor. AC circuits-Resistive, Inductive and Capacitive circuits, R-L, R-C and R-L-C circuits. Transformers-types, EMF equation, losses, regulation, efficiency. Principle of alternators, AC motors, DC motors and generators. Specifications, applications and features of different types of resistors, inductors, capacitors, relays, cells and batteries
- 2. Semiconductor Devices (06 marks):** Semiconductors, insulators and conductors. Types and properties of semiconductors. PN junction. Characteristics, principle and applications of Diode and Zener diode. Characteristics, principle, configurations (modes) and applications of BJT. Characteristics, principle and applications of FET, JFET, MOSFET and CMOS. Characteristics, principle and applications of UJT, SCR, DIAC, TRIAC, Varactor diode, tunnel diode, GUNN Diode PIN diode and Schottky diode. ICs-classification. Fabrication of monolithic ICs. Opto-electronic devices, Laser and Maser
- 3. Analog Electronics (08 marks):** Power supplies -Rectifiers, regulators and filters, SMPS, UPS- BJT Amplifiers -biasing, multistage amplifiers, types of coupling, feedback in amplifiers. Differential amplifier, Op-amp characteristics and its applications- Voltage follower, inverting & non-inverting amplifier, summer & difference amplifier, differentiator & integrator, Schmitt trigger, comparator, Active filters, PLL. Clippers and Clampers. Oscillators-Hartley, Colpitts, RC phase-shift, Wein-bridge and Crystal oscillator.
- 4. Measurement and Instrumentation (07 marks):** Measurements- methods, electronic measurement system. Dynamic characteristics of an instrument. Errors-types, statistical analysis of error. Standards. Bridges-DC and AC. PMMC meter, multi range voltmeters and ammeters. Electro dynamometer -voltmeter, ammeter, wattmeter. CRO, Signal generators & Wave analyzers. Electrical transducers- Strain gauge, Capacitive transducers, Hall-effect, piezoelectric type transducers, LVDT, Thermistors, Thermocouple, Piezoelectric and Proximity sensors. DVM, Electronic counters, Digital frequency meter, digital LCR meter and digital multimeter.
- 5. Industrial Automation (07 marks):** SCR as switch, Triggering, Commutation methods. Half wave and Full-wave controlled rectifiers. Choppers- principle, classification and Applications. Inverters -principle, Half and Full-Bridge Inverters, series inverter, Variable DC Link Inverter, Voltage Source and Current Source Inverters, PWM techniques used in inverters, Applications. Cycloconverters - Single phase to single phase midpoint cycloconverter, Applications of thyristors in speed control of motors, burglar alarm and light dimmers. Relay logic panel, Scanning considerations, Sensors and Actuators. Programming PLC-Relation to Digital Logic Gates - relation to Boolean algebra, PLC Register Basics-General characteristics - Holding Registers, Input & Output Registers. PLC Timer functions, PLC Counter functions, Basic Number Comparison Functions
- 6. Digital Electronics (08 marks):** Number Systems, Importance of binary system. Analog and Digital signals. Logic gates- Concept of logic, types, basic gates, universal gates, Boolean algebra, Demorgan's theorems, Boolean/logic expressions, simplification of expressions, K-maps. Combinational logic circuits-Adders, subtractors, encoder, decoder. MUX and DEMUX. Sequential logic circuits-Flip-Flops, Counters and Shift registers. Logic families. D/A converters. A/D converters. Memories-Terminology, classification and features. Programmable logic devices- PLA, PAL. Logic families.

7. **Applications of Electronics (04 marks):** Role and functions of electronics principles and devices used in: **consumer electronic gadgets**-calculator, washing machine, refrigerator, microwave oven, air conditioners, office-automation equipments; **Automobiles**- Electronic ignition, Electronically controlled suspension and Instrument panel displays; **Audio systems**- Microphone and Headphones, Loudspeakers; **Video systems**-Colour TV system and TV displays; **Entertainment**-Electronic music synthesizers; and **Robotics**-Components, Classification and Robotic Control system.
8. **Analog Communication (07 marks):** Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem. Resonance – series and parallel, Passive Filters and Attenuators. Antennas- terminologies, types and applications, antenna arrays. Electromagnetic spectrum and different types of wave propagation. Transmission lines- primary and secondary constants, reflection, standing waves and impedance matching. AM and FM-Modulation and demodulation.
9. **Digital Communication (07 marks):** Comparison of analog and digital communications. Base-band and pass-band transmission. Sampling theorem, Nyquist criterion and aliasing effect, and Quantization. Definition of information capacity, entropy, bit-rate, baud rate and bandwidth of digital data. Encoding- PCM, DPCM, DM and ADM. Line codes. Digital modulation techniques-ASK, FSK and PSK. Multiplexing techniques-FDM and TDM. Multiple access techniques-TDMA, FDMA and CDMA. Transmission media- twisted pair, co-axial and optical fibers.
10. **Advanced Communication (07 marks):** Microwave signal, Waveguides- types, TE and TM modes. Microwave devices- IMPATT, TRAPATT diodes, klystron, reflex klystron, magnetron and TWT. Radar range equation, Pulsed radar, modulators, duplexers and displays. Antenna scanning methods, MTI Radar, CW Doppler radar, FM-CW Radar. Satellite-basic terminology. Uplink and Downlink, Geostationary and polar satellite. LEO, MEO & GEO satellites, Satellite communication system, transponders, frequency allocation, communication satellites, satellite subsystems, earth station. GPS, DTH, VSAT and remote sensing. Features of 1G, 2G, 2.5G, 3G, 4G cellular networks, Cellular concept, Frequency reuse, features of GSM, CDMA, LTE. Wifi, Bluetooth and Zigbee.
11. **Data Communication and Networking (05 marks):** Categories of computer network, switching techniques, layers of OSI model, LAN -Ethernet, virtual LAN, GSM/CD access methods, token passing, FDDI, wireless LAN. TCP/IP-IP addresses, address mapping, ARP. Ports and sockets- DNS, Email, IMAP, FTP frame relay and ATM. Different methods of accessing internet, Modems, Routers, Bridges, Switches and Gateways, network security.
12. **C-Programming (03 marks):** Definition, need, and types of programming languages. Character set, Variables, Identifiers and Key-words. Data-types: Built-in, derived and user-defined. Constants and Literals. Operators and their Precedence. I/O statements. Control structure- loops and branching statements. Arrays, structures, unions, strings and pointers. User defined and library functions
13. **MATLAB (03 marks):** Features and applications of MATLAB, Character set, Variables, Identifiers and Key-words. Data-types: Built-in, derived and user-defined. Constants and Literals. Operators and its Precedence. I/O statements. Control structure- loops and branching statements.

- 14. Microcontrollers (07marks):**Features of RISC, CISC, Harvard and Von-Neumann architectures. Microprocessors and microcontrollers.variants of MCS-51. Architecture of 8051, Memory organization, 8051 Addressing modes, Instruction set ,I/O ports, Embedded C, Interrupts of 8051, timers and counters of 8051,serial I/O. Interfacing of displays, ADC, DAC, Stepper motor and DC motor
- 15. ARM Controller (05 marks):**Embedded system hardware- AMBA bus protocol,ARM core data flow model, Processor modes, Pipelining, ARM and thumb, Instruction Set,Assembler directives, Exception and Interrupt handling in ARM,LPC2148 CPU, Features and Applications of pin connect block, GPIO, PLL and Timers.
- 16. Embedded Systems (05 marks):**Embedded systems and General Computing system, Characteristics and quality attributes of Embedded System, Hardware and Software architecture of Embedded Systems, architecture of MSP430 ,Exceptions, Addressing Modes and Instruction Set of MSP430. MSP430 GPIO,Timerand On-chip Peripherals, MSP430 mixed Signal Systems
- 17. Verilog (03 marks):** Concept of HDL, Program Structure of Verilog- Lexical Tokens, Data types, Operators, Operands, Modules, procedures Behavioral Modeling, Structural Modeling, Gate-Level Modeling, Dataflow Modeling, Switch-Level Modeling.



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ANNEXURE-V
ELECTRICAL AND ELECTRONOICS

Each Module carries 20 marks

MODULE-1

Total Marks: 100

1.1. ELEMENTS OF ELECTRICAL ENGG:

Sources of electrical energy, Electrical current, e.m.f., voltage. Ohm's law, Electrical Resistance, Series- Parallel circuits. Laws of Resistance, Specific Resistance, temperature co-efficient. Work, Power and Energy, Joule's law of heat. Electric charge, Electric flux, Flux density, Electric field, Electric field intensity, Laws of electrostatics, dielectric constant and permittivity, Capacitance. Types of Capacitors, Capacitors in series and parallel, Energy stored in a capacitor. Faraday's laws of Electrolysis: Laws, Cell and a Battery. Lead - Acid Battery- Construction, Grouping of cells. Conductor, Resistor, Insulating and magnetic materials - properties and applications.

1.2. ELECTRICAL CIRCUITS:

Open, closed and short circuit; Linear, non linear circuits, passive active circuits, unilateral, bilateral circuits. Kirchhoff's laws, Star -delta Transformation. Thevinin's Theorem, Reciprocity Theorem. Superposition Theorem Maximum power transfer Theorem. Magnetic circuit, mmf, reluctance, Absolute permeability and Relative permeability. Flux, MMF and Reluctance. Cork Screw Rule and Right Hand Thumb Rule, Faraday's laws of Electromagnetic Induction, Types of induced emfs and their application ; Fleming's Right Hand Rule. Lenz's law; Self induced emf and Mutually induced emf and their application, Self inductance and Mutual inductance. Frequency, Amplitude, Cycle, Time period; Maximum value, RMS value, Average value, Form factor and Peak factor of a sinusoidal wave, Instantaneous value of Voltage and Current , phase and phase difference, Power and Power factor in AC circuits, Represent vectors in Rectangular, Trigonometric and Polar forms, Convert Rectangular form into Polar form and vice-versa. Current and Power in a pure resistive, pure inductive and pure capacitive circuit ; Capacitive reactance , Inductive reactance , Impedance, Current, Power and Power factor of R-L, R-C. R-L-C series and parallel circuits, Resonance, resonant frequency and Q-factor. Star and Delta Connection in 3-ph system, Relation between line voltage and phase voltage in 3-ph Star, Relation between line voltage and phase voltage in 3-ph Delta system, 3-ph power.

1.3. ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

Characteristics of instruments, types of errors, classification of instruments, types of torques in instruments,

Construction and operation of moving coil, moving iron instruments, calibration and range extension of voltmeter, ammeter,

Construction and operation, types, errors, calibration, application of wattmeter and energy meter, measurement of power and energy.

Measurement of Resistance, Inductance and Capacitance. – Wheat stone bridge, Kelvin bridge. Maxwell's bridge , Schering Bridge.

Digital meters – operation and applications of Digital frequency meter, digital synchroscope, digital non contact type tachometer, digital p.f.meter, digital trivectormeter, digital tong tester, digital LCR meter, digital multimeter and voltmeter.

Transducers, Sensors, Signal conditioning circuits and their application - strain gauges, LVDT, RVDT, Thermocouple, Pyrometer, Peizo-electric, Opto-sensor, Bolometer for measuring AF & RF power measurements

MODULE-II

2.1. DC MACHINES AND ALTERNATORS:

D.C. Generator - Principle, Construction and types, Materials used for construction-properties, Reasons for using these materials, slot insulation materials - properties. Functions of each part, Armature windings- Types of windings, Rules of lap & wave winding, application of lap & Wave windings. E.M.F equation, Armature reaction, De-magnetizing & cross - magnetizing effect, Commutation- methods of improving commutation. Characteristics- separately excited D.C. Generator; shunt Generator - critical resistance - conditions for voltage build up-failure to build up. Efficiency & voltage Regulation-Losses in D.C. Generator.

D.C Motor- Working principle –comparison of motor & Generator action. Back emf & voltage equation, Types of motors, Torque developed, Torque- speed relationship, Characteristics of D.C. Motors, Applications, Speed control, Starting Devices.

Alternator - Principle – Construction – Types. Armature winding, Emf equation, Armature Reaction and its Effects. Voltage regulation. O.C & S.C. tests, effective resistance, leakage reactance & synchronous reactance. Parallel operation, Excitation Systems, Hunting in alternators and its prevention. Cooling in alternators. Principle of working, construction and applications of the following motors - Universal motors, Reluctance motor, Two phase Four pole Permanent magnet Stepper motor, Servo motor, Brushless D.C. Motors and AC/DC Tacho-generator.

2.2. TRANSFORMERS AND AC MOTORS:

Transformers - Working principle, construction and classification. Emf Equation, Operation, Equivalent circuit of transformer, Regulation and Efficiency, Parallel operation, Three Phase transformers- working principle & construction , connections, Cooling of transformer, Auto transformer.

Induction Motors- working principle ,Types, construction ,Torque, slip, Equivalent circuit, Power output, losses, Starting and Speed control of Induction Motors.

Synchronous Motors- Working principle, construction, characteristics, hunting, starting, and applications.

Single Phase Induction Motors- Principle. Operation, types, characteristics, applications, linear induction motor, Magnetic Levitation, Induction Generators.

MODULE-III

3.1. ELECTRICAL POWER GENERATION

Conventional and non-conventional sources, Factors to be considered for selection of site, classification, functions of main component, comparison, advantages and disadvantages, environmental impacts of hydroelectric power plant, thermal power plant, nuclear power plant, diesel power plant, gas turbine power plant, Solar photovoltaic system, Wind power plant, Tidal power plant, Wave energy, Ocean thermal energy, Biomass power plant, Fuel cells, Hybrid PV systems, Urban waste to energy conversion, Power factor improvement.

3.2. TRANSMISSION DISTRIBUTION AND UTILISATION

Transmission system: AC transmission and distribution system, standard transmission and distribution voltages, Advantages and limitations of High voltage transmission, various systems for power transmission and distribution, Transmission through overhead and UG system, Compare HVDC and HVAC system

Overhead lines: Main components, Classification, Line, Short transmission line - equivalent circuit, equations for receiving end voltage, efficiency, voltage regulation and power factor, Corona- definition, formation, factors affecting corona, advantages and disadvantages, methods to reduce corona. Meaning of skin effect. Transposition of conductors.

Underground cables: Classification of UG cables, general construction of a single core UG cable, construction of 3 core XLPE cables. Essential insulating material properties for UG cables. Laying of UG cables- list the methods.

HVDC transmission lines: main components, advantages, Types of HVDC links –

FACTS Controllers- Definition, Objectives. Basic types of FACTS controllers and their functions.

SUBSTATIONS- Meaning of substation, classification, comparison between outdoor and indoor substation, single line diagram MUSS, components of substation, Bus bar arrangement- list the types- single bus with and without sectionalisation, double bus bar and ring main system. Importance of interconnecting in large power systems. Function of Load Dispatch Stations.

AC distribution system: Classification, connection schemes of distribution system, Meaning of Feeder, distributor and service main, characteristics of Feeder, distributor and service main. Concept of voltage drop in feeders/distributors - simple problem on DC distributor fed at one end. Distribution Automation

SCADA, components of SCADA and their functions and advantages

Electrical heating: Different types of domestic heating appliances, Advantages of electric heating, methods of electrical heating, temperature control methods of resistance heating. **Arc heating-** types, Induction heating-types, eddy current. Applications of eddy current heating, electric heating- principle and applications. Microwave heating-principle only.

Electric welding: Definition, types- resistance and arc welding, resistance welding list the types- spot welding and seam welding, Arc welding- list the types, AC arc welding machine, Mention the special types of welding- electron beam welding and laser welding.

Electro chemical process- Principles of electro deposition, laws of electrolysis, Electro plating, Factors affecting Electro plating, Factors governing Electro better electro deposition.

Refrigeration: types of refrigerants. State the properties of refrigerants. Vapour compression refrigerator, electric circuit of domestic refrigerator, necessity of thermostat, defrosting-types of defrosting, need for air conditioning, principle of air conditioning, electrical circuit for air conditioning unit, types of air conditioning system.

Illumination: Laws- solid angle, luminous flux and luminous intensity and illumination,, source of light- types of lamps, lighting schemes. Design of lighting scheme - utilization factor, depreciation factor, space to height ratio requirements of good illumination

3.3. SWITCHGEAR AND PROTECTION

Fundamentals of Protection- Sources and Types of faults & Harmful Effects of short circuit current, Symmetrical Faults on Three Phase Systems. Percentage reactance and Base KVA, Reactor, Use of current limiting reactors & their arrangements. Causes of over voltages, Lightning phenomena & over voltage due to lightning, Types of lightning arresters and surge absorbers- their Construction and principle of operation.

Fuse and Circuit Breaker - Features of Switchgear, different Switchgear equipment used for switching and interruption of current, Indoor type and Outdoor type Switchgear, Characteristics of Fuse elements, Types of Fuses, Fuse Element Materials, Important Terms of fuse, HRC fuses – construction, types, working. Merits, Demerits and applications, Arc formation, arc extinction, Trip Circuit Mechanism, Circuit Breaker-rating, terminologies, Classification, Construction, Working, Merits, Demerits, Applications and Maintenance Schedule of OCB (Plain oil), ACB(Axial blast, cross blast), SF₆ (Sulphur Hexa Fluoride) CB Non Puffer Type, vacuum CB.

Protective Relays - Qualities of Protective Relaying, Necessity for Protection, Primary and Back up protection, Classification of protective Relaying, Important Terms, Construction and working of Induction type Non-directional over current relay, Static Type Over Current Relay, Comparison of Static Relays with Electro-Magnetic Relays, Microprocessor based Over Current Relay, Differential relay- Current differential and Voltage balanced Differential relay, Distance relays- Definite distance and Time-distance Impedance Relay. Numerical relay- working, Advantages and types, Testing Methods for Relays Protection of Alternators and Transformers- Protection of Alternators- Abnormalities & Faults Differential protection, Balanced Earth Fault Protection, Stator Inter Turn Protection Protection of Transformers- Abnormalities & Faults, Protective Systems for Transformers, Buchholz Relay, Earth Fault or Leakage Protection, Combined Leakage and Overload Protection, Circulating Current Scheme for Transformers Protection Protection of Feeders and Bus-Bars: Feeder

Protection- Abnormalities & Faults, Time Graded Over Current Protection, Differential Pilot Wire Protection, Distance Protection, Bus – Bar Protection- Abnormalities & Faults, Differential Protection of Bus –Bars, Substation and Maintenance: Indoor and outdoor type substation, various units of substation, Testing methods of Circuit Breakers. Testing methods of CT's & PT's, Maintenance Schedule of Relays, Types & importance of Neutral Earthing , Substation Earthing, Principle and applications of Peterson coil

MODULE-IV

4.1. ANALOG ELECTRONICS:

Semiconductors , P N junction Diodes, Zener diode, Varistor and Thermistor, Transistors and MOSFETs, Optoelectronic devices –photo diode, opto isolator, photo voltaic cell, LED, LDR, LCD, opto coupler. Rectifiers, filters and regulators, Amplifiers and Oscillator. CRT.OP-AMP and Timers.

4.2. DIGITAL ELECTRONICS:

IC Logic families, Digital Principles and Number system, Boolean Algebra, De Morgan's theorem, Logic Gates, Karnaugh's map, Adders, Multiplexer, De-Multiplexer, Encoders, Decoders, Flip flops, Shift Registers, Counters, Digital Interfacing, ADC and DAC, Memories

4.3. COMMUNICATION AND COMPUTER NETWORKS

Radio Communication: Elements of communication system, Forms and types of communication, Modulation methods

Electromagnetic spectrum: Relationship between frequency (f) and wavelength (λ), Need for modulation, Electromagnetic spectrum, Bandwidth, Modulation and demodulation circuits

Radio transmitter and Receiver-Transmitter-functions, FM transmitter, Receiver - Super heterodyne receiver.

Multiplexing: FDM- transmitting end, FDM- receiving end TDM-definition.

Transmission lines–types, Co-axial cable. characteristic impedance, characteristic impedance of co-axial cable, Standing Waves. Standing wave ratio, importance of SWR.

Radio wave propagation: ground wave, sky wave, space wave.

Fiber Optic Communication: Elements of fiber-optic communication system, Applications, Benefits, Light rays in a fiber optic cable, construction Mode-definition, classification, ILD optical transmitter, Photodiode optical receiver.

Microwave Techniques: Advantages, Problems faced in microwave communication, Wave guides, Cavity resonators, Microwave semiconductors –problems faced by conventional semiconductor components and their remedies. Microwave tubes, Microwave antennas.

Satellite Communication: Satellite orbits- geo synchronous orbit, Transponder, working, Satellite sub system, Satellite Earth Station. Applications.

GPS - GPS architecture, GPS receiver, Differential GPS, Applications of GPS, GIS – concept; applications.

Mobile and Data Communication: Mobile communication – Multi cell system, frequency reuse, Salient features of GSM, GSM services. GSM system architecture, GSM network area –definitions- cell, location area, MSC/VLR service area, PLMN, GSM operation-call from mobile station, call to a mobile station, Concept of GPRS, Compare 2G with 3G.

Data Communication - Concept, Applications, Modes of Transmission, channel capacity, bandwidth, baud rate, bit rate, Modem - need for modem, FSK-concept, working, PSK - concept, BPSK–concept. BPSK modulator. BPSK demodulator.

MODULE-V

5.1. POWER ELECTRONICS:

Power semiconductor devices- Structure, working Characteristics, types and applications of Power diode, MOSFET, IGBT, SCR. LASCR. GTO. TRIAC. Turning on methods and commutation of SCR, ratings, reliability, protection & mounting of SCR.

CONVERTERS, CHOPPERS, INVERTERS. CYCLOCONVERTERS - Types, operation and application, advantages and disadvantages

Power supplies and stabilizers-SMPS, Buck, Boost, Buck-Boost and Fly back converter, power line disturbances, Relay type AC voltage stabilizer. AC servo voltage stabilizer, UPS- Battery size, voltage required, ON line and OFF line UPS

Power system applications- Static AC circuit breaker. interconnection of renewable energy sources and energy storage systems to the utility grid. Thyristor switched capacitors and thyristor switched inductors (Reactors),

Industrial applications -SWITCH mode welder. Voltage source series resonant inverters, solid state relay, speed control of shunt wound DC motor. soft starting of Induction motor, static slip recovery system in induction motor(static scherbius drive). speed control of Induction Motor by Variable voltage frequency method

DOMESTIC APPLICATIONS-High frequency lighting system, SCR battery charger.

5.2. INDUSTRIAL DRIVES AND CONTROL

Concept of electric drive, Power modulators, Motors used in drives, types of loads, choice of drives, classification of drives, Multi quadrant operation of Drives, selection of drives for paper mill, cement mill, sugar mill, steel mill, Hoists and cranes, centrifugal pumps and compressors, solar powered pump drives,

CONTROL SYSTEM- Open and closed loop systems.

COMPUTER BASED INDUSTRIAL CONTROL- Hierarchical levels of CIM, Microcontroller based DC Motor speed control, Fuzzy logic. Process control in thermal plant and cement plant

ELECTRIC TRACTION- Traction systems. Tractive effort, nature of traction load, requirements of traction drives, Drives in traction, electric braking, current collection, Train lighting system

5.3.ELECTRICAL ESTIMATION AND COSTING

Estimation- purpose, factors considered, quantities of a good estimator. Specification- importance, factors considered, Standardization and its advantages. Overhead charges, stock incidental charges, contingencies, supervision charges, labour charges. Inspection/Inspectorate charges, transportation charges and miscellaneous charges. Tender/tender notice, quotation, comparative statement, purchase order and work order. Earthing -touch potential, step potential, necessity of earthing, Points to be earthed, earth resistance, types of earthing- Pipe earthing, Plate earthing SERVICE MAINS- types of service mains- Over Head Service Mains, JG Service Mains. current ratings for Aluminium, copper conductors, Types of Towers. ACSR conductors and Number of Disc insulators in suspension string, strain string, span and height of towers for 66 KV, 110 KV, 220 KV transmission lines

5.4. ENERGY MANAGEMENT

Energy management and its importance, energy conservation and its need, Methodology of energy management, energy management techniques, energy crisis, causes of energy crisis, Energy management software(EMS) various stages of EMS, Describe Energy and facility management system(EFMS) purpose of EFMS, Methodology of EFMS Processes in EFMS, block diagram of EFMS components & applications of EFMS, Need of energy conservation

in India, ENERGY CONSERVATION ACT 2001, the national role of IRDEA (Indian renewable energy development agency) in energy conservation, Energy conservation in T&D lines., measures to optimize T&D losses, Energy conservation in industries, role of power factor improvement in energy conservation . energy conservation in domestic sector, industrial sector, agriculture sector, Energy efficiency- its significance, energy efficient devices, energy efficient motors, applications energy efficient motor , selection of electric drives, energy conservation in electric drive . energy efficient lighting sources, power quality, and its parameters, power quality measurable quantities, power quality problems and its remedies , pricing of electricity, Need for energy audit, scope and types of energy audit, Methodology, demand side management (DSM), need for DSM and benefits of DSM, DSM implementation strategy, DSM implementation of program.



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ANNEXURE-VI
COMPUTER SCIENCE & ENGINEERING / INFORMATION SCIENCE &
ENGINEERING
MODULE -I

Total Marks: 100

Digital and Computer Fundamentals

10 Marks

Number Systems - Binary, octal, decimal and hexa-decimal, Conversion from different number systems to others, 1's complement and 2's complement, ASCII Code; *Logic gates* - OR, AND, NOT, NAND, NOR; *Combinational Circuits* - Half adder, Full adder, Encoder, Decimal-to-BCD encoder, Decoders, BCD-to-Seven Segment Decoder, Multiplexer, 4:1 mux and DeMultiplexer, 1:4 Demux; *Introduction to Computers & Computer Software* - Introduction, Characteristics of Computers, Evolution of Computers (abstract only), Generations of Computers, Classification, Computer System, Applications; *Software* : Software categories, Machine language, Assembly Language, High level language; *Peripherals & Memory* - Input devices and Output devices, Primary memory- RAM, ROM, Types of ROM, Secondary memory- Hard disk, Optical disk – DVD, Blue Ray.

Operating Systems

10 Marks

Process concept, Process scheduling, Operations on processes, Inter-process communication, Process Scheduling concepts, Scheduling criteria, Scheduling algorithms, Synchronization – Background, The critical section management and semaphores, Deadlocks- System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, Swapping, Contiguous memory allocation, Paging, Structure of page table, Segmentation, Demand paging, Copy-on-write, Page replacement, Allocation of frames.

MODULE -II

Programming with C

20 Marks

Introduction: Variables and Identifiers, Built-in Data Types, Variable Definition, Declaration, C Key Words-Rules & Guidelines for Naming Variables, Constants and Literals, Precedence and Order of Evaluation, Simple assignment statement, Basic input/output statement, Conditions, Relational Operators, Logical Operator, if statement, if-else statement, nested if-else, if-else ladder, switch, break, continue, goto and Labels. Looping statements – while, do-while, for and nested for loop; *Functions* - Definition of Function, Standard Library of C functions, function prototype, Formal parameter list, Return Type, Function call, Block structure, passing arguments to a Function: call by value; *Array*– Definition, declaring an Array, Initializing an Array. One and two dimensional arrays, Declaring & Initialization of two dimensional arrays, Null terminated strings as array of characters, arrays as function arguments; *Strings* - Introduction, Declaring & Initializing string variables, Reading & writing strings from variables, String handling functions; *Pre-processors* - Introduction, Macro substitution, File inclusion; *Structures and Unions* - Definition, Structures variables, initialization, nested structure, arrays of structures, Unions, Concept of pointers, Declaring and initializing pointers, Accessing variables using pointers, Pointer arithmetic, Pointers and arrays, Pointers and character strings, Pointers and functions, Pointer as a function argument, Pointers to function, Pointers and structures., Dynamic memory allocation, Allocating a block of memory: malloc(), Allocating multiple blocks of memory: calloc(), Releasing the used space: free(), Altering the size of memory: realloc(), Defining and opening a file, closing a file, Input / Output operations on files, Error handling during I/O operations, Random Access to files, Command line arguments

MODULE -III

Data Structures using C

10 Marks

Types of data structures-Primitive & non – primitive data structures, The Stack- Definition and examples, Primitive Operations- Push and Pop, Applications of Stacks- Infix, Postfix and Prefix Expressions, Recursive definition, the queue and its sequential representation, Linked linear lists, Circular linked lists, doubly linked list.

Data Base Management System

10 Marks

Characteristics of the database approach, Actors on the scene, Workers behind the scene, Advantages of using the DBMS Approach, Data Models, Schemas, and Instances, Database Languages and Interfaces, Classification of database Management System, Entity Types, Entity Sets, attributes and keys, Relation Types, Relationship Sets, roles and structural constraints, Weak Entity Types, ER Diagrams, naming, conventions and design issues, Relational Model concepts, Relational Model Constraints and relational database schemas, Update Operation, Transaction and Dealing with constraints violations, SQL: DML, DDL & DCL related commands, Normal forms based on primary keys, General Definition of second and third normal forms, Boyce-codd Normal form.

MODULE -IV

OOPs with JAVA

15 Marks

Object oriented Paradigm, Basic Concepts of OOP, Benefits of OOP, Applications of OOP; Java Program Structure, Java Tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Command Line Arguments, Programming Style, Constants, Variables, Data Types, Scope of Variables, Symbolic Constants, Type Casting, Standard Default Values, Special Operators, Mathematical Functions, Labelled Loops (break & Continue) Operators and Expressions, Decision Making, Branching & Looping; Defining a Class, Fields Declaration, Methods Declaration, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, *Inheritance*: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract Methods and Classes; Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables; Java API Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package; Creating Threads, Extending the Thread Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface; Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using Finally Statement, Throwing Our Own Exceptions.

Design and Analysis of Algorithms

05 Marks

What is an Algorithm? Fundamentals of Algorithmic problem solving, important problem types. Fundamental data structures, Analysis Framework, Measuring the input size, Units for measuring Running time, Orders of Growth, Worst-case, Best-case and Average-case efficiencies, Asymptotic Notations and Basic Efficiency classes, Informal Introduction, O-notation, Ω -notation, θ -notation, Introduction to Brute Force approach, Selection Sort and Bubble Sort, Sequential search, Exhaustive Search- Travelling salesman Problem and Knapsack Problem, Depth First Search, Breadth First Search, Introduction to divide and conquer, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties, Decrease-and-Conquer- Introduction, Insertion Sort, Topological Sorting.

MODULE -V

Computer Networks and Security

10 Marks

Networks – Categories of networks, Internetwork – Internet and Protocols, Overview of Networking, Need for Networking, Hardware and Software components, Network Communication Standards, OSI Reference Model, TCP/IP Model, Overview of network topologies, Basic topologies- bus, ring, star, mesh and hybrid; LAN Cables – Co-axial, twisted pair, optical fibre, LAN connectors- co-axial cable, and twisted pair cable, optical fibre, LAN devices – repeaters, hubs, switches, NIC, WLANs; TCP/IP addressing scheme- Components of IP addressing, IP address classes. Computer security concepts, The OSI security architecture, Security attacks, Security services, Security mechanisms, Standards, Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Random and Pseudorandom Numbers, Stream Ciphers and RC4, Cipher Block Modes of Operation, Approaches to Message Authentication, Secure Hash Function, Message Authentication Codes, Public Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures.

Web Programming

10 Marks

Introduction to HTML: Web site, Web Page, Types of Web Pages, Browsers and their types, Client –Server Model, Web –Server, Working of different types of Web Pages, General structure of a Web Page, Scripting languages, URL. Introduction to XML, The Syntax of XML, XML Document Structure, Document Type Definitions, Declaring Elements, Declaring Attributes, Declaring Entities, Internal & External DTDs, Namespaces, XML Schemas, Defining the Schema, Defining the Schema Instances. Origins and Uses of PHP: Overview, General Syntactic Characteristics, Primitives, Operations and Expressions, Variables, Integer Type, Double Type, String Type, Boolean Type, Arithmetic Operations & Expressions, String Operations, Scalar Type conversions, Output, Control statements, Relational Operators, Boolean Operators, Selection Statements, Loop statements, Arrays, Array Creation, Accessing array Elements, Functions for Dealing with Arrays, Functions, General Characteristics of Functions, Parameters, The scope of Variables, The Lifetime of Variables, Pattern Matching.



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ANNEXURE-VII

CIVIL ENGINEERING

Group Code: CE

Total Marks 100

1. Materials of construction

06 Marks

Stones - Classification of rocks, Tests on stones, quarrying of stones. **Bricks** - Types, Indian Standard classification, manufacturing process, types and tests, water absorption, Refractory bricks. **Cement** – Compounds, clinker Composition, types, tests setting times, strength. **Timber** - Classification, defects, dry and wet rots, preservation, seasoning, market forms of timber Plywood. **Metals** - mild steel, copper, aluminum alloy, steel alloy. **Paints, varnish & distemper** - Ingredients, types

2. Surveying

10 Marks

Principles, Classification of surveys, prismatic compass, local attraction; triangulations and traversing **Leveling** - Terms in leveling, Bench mark, types of leveling, Reduction of levels, L/S, C/S. Contour, characteristics of contour, computation of area, volumes, Capacity reservoir. **Theodolite surveying** – measurement of horizontal & vertical angles, deflection angle, latitude, departure, Bowditch's & Transit rule measurements and adjustment of observations. **Trigonometric leveling** – height & distance for different cases. **Tacheometry** – definition, stadia, system of tacheometry. **Curves**- types, elements of curve, designation, setting out curves, GIS, GPS global positioning system, remote sensing,

3. Engineering Mechanics and Strength of materials

14 Marks

Moment & Couples, resolving of forces, Centre of gravity, Moment of Inertia, radius of gyration, Parallel & Perpendicular axis theorem, **Stress & strain** – Types of stress, Hook's law, factor of safety, lateral & linear strain, stress strain diagram, Poisson's ratio, **Bending moment & Shear force** – Types of supports, beam & load, Shear force & Bending Moment Calculation for cantilever, Simply supported & Over hanging beam with point load & UDL, Point of contra flexure. **Simple Bending** – bending stress, equation, flexural rigidity, section modulus, modulus of rupture. **Slope & Deflection** – definition of slope, deflection & curvature, calculation of Slope & deflection for cantilever, simply supported beams with point load & UDL (moment area method). **Columns & strut** – Definition of column & Strut, types, effective length for different end conditions, slenderness ratio, Buckling load.

4. Construction Technology

06 Marks

Types of foundation & suitability, SBC of soil, Technical terms in Brick & stone masonry. Types of damp proofing materials, types of Doors & windows, fixtures for doors & windows. Lintel & arches, Scaffolding, shoring & under pinning, Technical terms in stair, types of stairs. Types of roof, Plastering & pointing, types of floors, Ventilation.

5. Water supply Engineering

05 Marks

Ecological chain and balance, Sources of water, Intakes water requirements, Estimation of demand, per capita demand, Water quality standards, impurities, tests, purification of water, Primary and secondary treatment, sedimentation, coagulation, chlorination, Conveyance and distribution system, appurtenance, water conservation.

6. Sanitary Engineering

05 Marks

Definition of sewage, sewer, garbage, sullage, types of sewerage system, Characteristics of sewage, quantity of sewage, sewer appurtenance, sewage treatment & disposal, house drainage system, collection & disposal of solid waste. Sources and effects of air pollution, Noise pollution and standards

7. Hydraulics

09 Marks

Fundamentals – properties of fluids, total pressure, centre of pressure for circular, rectangular & triangular vertical plates. **Flow of fluids** – Types of flow, Bernoulli's equation, continuity equation.

Hydraulic jump, **Flow through orifice** – Types of orifice, Vena contracta, Hydraulic co-efficients & their relationships. **Flow through Notches**- discharge over rectangle & triangular notches. **Flow over weir** – Types of weir, discharge over rectangular weir, end contraction. **Flow through canals** – Types, Chezy's & Manning's formula, Most economical section. **Flow through pipes** – Types of Major & minor losses, water hammer, surge tanks.

8. Water Resources Engineering

10 Marks

Hydrology – Hydrological cycle, precipitation, Evaporation and transpiration, runoff, computation of average rainfall. **Irrigation** – Base period, Crop period, Duty, Delta & Relationship, hydrographs, types of irrigation, methods of irrigation. **Reservoirs & Dams** – gravity & earthen dams, spillways, gates. **Distribution & cross drainage works**- Types of canals, Canal alignment, canal lining, aqueduct sluices. **Diversion & river training works**- Weirs, barrages, canal head regulator, marginal bunds, guide banks. **Ground water** – Types of Aquifers, porosity, ground water yield, specific yield, specific retention, permeability, transmissibility.

9. Concrete Technology

06 Marks

Ingredients of concrete, Admixture-mineral and chemical, W/C ratio, Grade of concrete & steel, calcium silicate hydrate, Transition zone, Workability, Segregation, bleeding, Strength, Maturity concept, characteristic strength, Modulus of elasticity, Permeability, durability, Shrinkage, Creep, chloride attack, sulphate attacks, NDT, Design mix concepts, Curing, Special concrete, High strength concrete & steel for Pre stressing, Post tensioning, Pre tensioning.

10. Design of RCC

10 Marks

RCC Limit state – Limit state of collapse, limit state of serviceability, as per IS 456-2000 Characteristic strength of materials, partial safety factors, stress block, Neutral axis, Moment of resistance.

Analysis and design requirements for – Singly reinforced, doubly reinforced sections for flexure and shear, lintels, T-Beam, one way slab, Two way slab, Continuous slab, sun shade and cantilever slab, short column for axial load, square footing, dog legged stair case spanning longitudinally.

11. Design of Steel structures

04 Marks

Analysis and design requirements for – Bolted & welded joint, main & secondary beams, effective length & slenderness ratio for column, slab base & gusseted base plate, strut, end conditions.

12. Transportation Engineering

09 Marks

Roads – Importance of transportation, classification of roads, geometrics, types of pavements, road drainage, traffic engineering. **Railways**- Permanent way, rails, sleepers, ballast, points & crossings, station & yards. **Bridges**– Elements of bridges, types of bridges.

13. Construction management

03 Marks

Construction Team, Construction stages, Bar chart, CPM, PERT, Organization in PWD. Contract, Types of Contract, Tender, EMD, SMD, measurement book, Indents, Bin cards. payment of bills, Safety in construction.

14. Estimation & costing

03 Marks

Units of measurements, types of estimate, specification, analysis of rates, BOQ, schedule of rates, valuation, rent fixation, depreciation, scrape value, market value, book value, earth work quantities.



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ANNEXURE-VIII

CHEMICAL ENGINEERING & POLYMER ENGINEERING

Total Marks: 100

UNIT-I : Physical Chemistry and Organic Chemistry:-

20 marks

Atomic weight, Equivalent weight of elements, Definitions and determination of Equivalent weights, Concepts of Enthalpy, Enthalpy of reactions, formation. Solution, combustion, neutralization and Phase changes, Law of conservation of energy, Hess's law of Heat summation, Chemical Equilibrium, Constant, Free energy change, Standard free energies, Avogadro's number, Chemical Kinetics, and Molecularity of reactions, Electrochemistry- Acid and Bases and their properties.

Aliphatic hydrocarbons, Saturated and Unsaturated, Properties, preparation and uses of Methane, Ethane, Ethylene, Acetylene, Homolog series, Isomerism, Chain position, Functional, CIS and IUPAC system and System of naming Organic compounds, Hydrocarbons, Petroleum refining and Cracking.

UNIT-2 : Unit operations - I :-

20 Marks

Purposes of agitation, Impellers, Propellers, Paddles, Turbines, Swirling and Vortex formation and their prevention, Mixing Equipments, Principles of Conveying, Types of Conveyors, Conveyor Accessories, Fields of applications. Size reduction- Principles and applications, Crushers- Jaw crusher, Grinders- Ball mill, Ultrafine grinders, Hammer mill, Fluid energy mill. Concepts of fluids,

Dimensions and units, Basic principles of fluid state, Viscosity, Application of manometry, Newtonian and Non-Newtonian fluids, Flow of fluids- Laminar and Turbulent flow- Reynold's experiment and Reynold's number, Flow measuring devices, Bernoulli's theorem and applications, Fluid flow machineries, Valves, Centrifugal and reciprocating pumps and their characteristics

UNIT-3: Chemical Process Calculations:-

20 marks

Units and Dimensions, Fundamental quantities and derived units, merits of SI system of units, conversion of units, Basic concepts of chemical calculations- gram atom, gram mole. Use of molar units, Methods of expression of composition of solids, liquid and solutions- Weight percent, Volume percent, Mole fraction, Mole percent, Equivalent weights, Normality, Molarity, Molality, Material balance- Steady state material balance equations, material balance calculations without chemical reactions.

UNIT-4: Chemical & polymer technology, Instrumentation:

20 marks

Manufacture of Definition of polymer – Classification reactions involved in the formation of polymers – Methods of polymerization – Manufacture of poly ethylene by Ziegler process – Manufacture of polyvinylchloride - phenol formaldehyde - Polystyrene - Polyester –Natural rubber, manufacture of synthetic rubber.(SBR)

Process variables, Static and dynamic characteristics of process instruments, measurement of temperature, pressure, level, density, humidity and pH.

UNIT-5: Unit operations - II:-

20 Marks

Heat transfer – Conduction, Convection, Radiation, Surface co-efficient and overall co-efficient, Natural and Forced convection, Heat transfer to Boiling liquids, Condensation, Heat transfer equipments - Evaporators.

Drying- Definition of terms- equilibrium moisture, Bound moisture, Unbound moisture, Free moisture, Drying equipments.



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ANNEXURE -IX

AERONAUTICAL ENGINEERING

Total Marks:100

1. BASIC AERODYNAMICS AND AIRCRAFT MATERIALS

BASIC AERODYNAMICS:

07 Marks

The atmosphere, Fluid pressure, Standard atmosphere, International Standard Atmosphere (ISA), Temperature, Measurement of temperature, Conversion factors for units commonly used in various countries, Pressure, Pressure altitude, Effect of pressure, temperature and humidity on density, Density altitude, ICAO Standard atmosphere, Standard atmosphere as per ISA(International standard atmosphere), Behaviour of air, Speed of sound, Dynamic pressure, static pressure and total pressure Terms and difference between the three pressures, Explanation of total pressure in terms of dynamic and static pressure, air speed terminology in use and their meaning, Venturi tube, Theory of lift, The circulation theory of lift, Low speed aerofoil, Aerofoil terminology, Types of aerofoils. Factors affecting the performance of aerofoils. General theory of generation of lift in a wing, Aspect ratio and stalling angle, Sweep back wings, Slats and flaps, Effect of compressibility on lift, effect of various speeds on coefficient of lift(CL), Transonic and Supersonic Aerodynamics, Shock waves.

AIRCRAFT MATERIALS:

05 Marks

Selection of materials, economic consideration, Availability, Cost, shaping equipment required. Engineering considerations- Strength, Weight, Corrosion, Aircraft materials and their properties- types of plain carbon steel, Steel numbering system-SAE (Society of Automobile Engineers). Nickel alloys, Aluminium alloys, Composite materials, Advantages of composites, Corrosion and corrosion prevention and its effects on aircraft structures, important factors which influence corrosion process.

2. AIRCRAFT INSTRUMENTS AND AIRCRAFT SYSTEMS

AIRCRAFT INSTRUMENTS:

05 Marks

Four important Instrument elements, Pressure measurement systems, two main categories of pressure measurements- direct reading and remote indication, Temperature measurement systems for aircraft - special requirements, range, Methods of temperature measurements, RPM measurement systems and its importance, Fuel measurement systems, importance of fuel measurement, Fuel contents gauge, Float arm gauge, capacitor type of gauge. Pitot system of aircraft- purpose and working principle. Altimeter - theory of operation, Pressure altitude and indicated altitude, 'Q' Codes and their purpose, Air Speed Indicator- purpose, Air speed terminology, Square law compensation for air speed indicator, Rate Of Climb/Decent Indicator(ROCI)- purpose, Various types of Metering unit and its purpose, Machmeter - purpose and need for machmeter, Gyroscope- its application in aircraft, properties, Three degrees of freedom, Gyroscopic references, Limitations of a free gyroscope, Artificial Horizon (AH)- introduction, Turn And Bank Indicator (TBI)- its purpose, Aircraft Heading System- purpose, Direction Indicating/Radio Indicating Compass- DI/RI Compass, RMI front panel/display, Cabin Pressurisation- need for cabin pressurization, Standard practice of pressurization, CPCV, Aircraft Oxygen System- purpose, Types of aircraft oxygen system i.e. continuous flow type and demand type, Important components, L O X (liquid oxygen) System, Head Up Display, Head Down Display, Multi Function Display, Fly- By Wire Technology.

AIRCRAFT SYSTEMS:

07 Marks

Aircraft Flight Control Systems- Axes of Motion Vertical, Longitudinal and Lateral, Primary Control Surfaces, SECONDARY Control Surfaces, Tertiary Control Surfaces, Primary flight controls-Pitch, Roll, Yaw, Throttle, Secondary effects of controls: explain briefly, Main Control Surfaces, Trim tabs, Spoilers, Flaps, Slats, Air brakes and Classification of flight control systems (FCS), Aircraft Fuel Systems- Fuel system. Information system- Fuel contents, Fuel Pressure, Low/critical fuel level warning, Positive transfer of fuel from various tanks, Safety-Protection of the systems from hazards, refuelling, De-fuelling, Aircraft Remote Control Systems Media-Mechanical, Aircraft Remote Control Systems-Hydraulic Media, Hydraulic System, Remote Control System- Pneumatic Media, Aircraft Undercarriage Systems, Features of Nose Undercarriage, Steering system of an Aircraft-need and types of steering, Aircraft Environment System- Cabin pressurization and air conditioning systems, Altitude limits, Aircraft Emergency Systems, Aircraft fire warning systems-common causes, Purpose and function of fire detection system, Ice And Rain Protection Systems- Common flight hazards due to ice-pitot tubes, control systems etc, Areas sensitive for ice formation

3.AIRCRAFT STRUCTURES AND SOM

AIRCRAFT STRUCTURES:

07 Marks

Air Frame Design and Construction- Structural members, Major structural stresses, Plane truss and analysis of forces in the members, Fixed Wing Aircraft- Identification of aircraft structural components for fixed wing, single engine, propeller driven aircraft, Fuselage Of Aircraft- various sections of fuselage, Types Of Fuselage- Truss type, Monocoque, Semi-monocoque, . Wing Structures- three fundamental designs for wing structure - Mono spar, Multi spar, Box Beam, Wing Configurations- various wing configurations, Leading edge shapes, Trailing edge shapes, common forms of wings- Low, Dihedral and Delta wings, Spars And Ribs purpose, Basics Of Honey Comb Section Wings- Basics Of Nacelles/Pods, Cowlings- Cowlings, skin and fairing, Main Control Surfaces- purposes, Loads On Aircraft- Types of loads, design load, Helicopter Structures-Location of major helicopter components, Wooden Aircraft Structures- aircraft fabrics, doping and dopes, Aircraft Painting and Finishing – importance, Effect of proper finishing.

SOM

05 Marks

Simple stresses & strains viz. tensile, compressive, Shear, Crushing, Thermal stresses, & corresponding strains-Problems on Direct Stress & Linear Strain- Stress-,Hook's Law- Strain curve for Ductile material and Brittle material with all parameters.- factor of Safety. Elastic Constants - Lateral Strain .Poisson's ratio, Bulk Modulus, Shear Modulus ,Volumetric Strain-Relation between elastic constants- Problems on elastic constants.

Definition - Shear Force and Bending Moment –Types of beams, types of load acting on beams ,Sagging & Hogging Bending Moment and its importance –sign convention to draw SFD and BMD- Concept of Maximum bending moment.

Centre of Gravity, Moment of Inertia & its Importance -Parallel & Perpendicular Axis Theorem-C.G of Rectangle, Triangle, Circle, Semi-circle, T-Section, I-Section, L-Section, Channel-Section. Introduction to Torsion , Angle of Twist Assumptions in theory of Torsion -Power Transmitted by a shaft, axle of solid and hollow sections subjected to Torsion - Comparison between Solid and Hollow Shafts subjected to pure torsion.

4. **THERMODYNAMICS, PISTON ENGINE THEORY AND JET ENGINE THEORY**

THERMODYNAMICS

05 Marks

Basic concepts-Definitions :system - boundary, surrounding, working fluid and state of a system.-thermodynamic systems – closed, open and isolated systems Properties of system- Intensive and Extensive properties Definitions for properties like Enthalpy (H), Entropy(s) Internal energy (U)- Specific heat at constant pressure(C_p), specific heat at constant volume(C_v) for a gas-Relation between C_p & C_v , characteristic gas equation, Universal gas constant, Definitions for quasi-static work flow-Law of thermodynamics-Zeroth, first & second laws of thermodynamics-Steady flow energy equation

Thermodynamic processes- Explain with P-V and T-S diagram the Constant pressure, Constant volume, Isothermal, Isentropic, Polytrophic, Free expansion and throttling processes & equations representing the processes- Derivation for work done for the above processes- Calculation of change in internal energy, heat supplied or rejected, change in Entropy for the above processes. Thermodynamic cycles – reversible and irreversible cycles conditions for reversibility of a cycle-Explanation of Carnot cycle with P.V. and T-S diagrams, Air standard Efficiency.

PISTON ENGINE THEORY:

05 Marks

Otto cycle, Difference between two and four stroke spark ignition engines. Purpose of reduction gear box, Engine power, engine rating and engine efficiency, Super charging, Fuel and carburetion, Induction, cooling and exhaust.

JET ENGINE THEORY:

07 Marks

Basic theory of jet propulsion, Principle of operation of jet engine, Thrust and its equation. Classification of jet engines, Brayton cycle. Types of jet engines turbo prop, turbojet, turbofan. Subsonic and supersonic inlet ducts. Centrifugal and Axial flow compressor, compressor stalling and surging. Types of combustion chambers. Impulse and reaction type turbine. Purpose and working of Thrust reversal. Purpose of Afterburner.

5. **AVIONICS AND AIRCRAFT RADIO SYSTEMS ,AIRCRAFT ELECTRICAL SYSTEMS**

AVIONICS AND AIRCRAFT RADIO SYSTEMS:

10 Marks

Radio Communication System Fundamentals – EM waves, medium of propagation, Radio and radar frequency spectrum, uses and limitation of R.F. bands. Radio wave propagation – ground wave, sky wave, radiation angle, skip distance, diffraction, field strength, absorption, Scattering, reflection, fading, ducting, critical frequency, Antenna Fundamentals - Dipole, half wave dipole, resonant & Non-resonant antenna. Antenna gain, directional power, Antenna Losses and efficiency, band width, beam width, band width, polarization, Types of various communication used in aircraft- VHF, UHF, HF SATCOM, Intercom, PA system, Navigation System of aircraft- safe route, economy, shortest possible route, Flight Data Recorder(FDR) and Cock Pit Voice Recorder (CVR), Location of FDR and CVR, Radar range equation, Purpose and use RADAR in various fields, meaning of Primary RADAR, Secondary RADAR- advantages, disadvantages, Secondary RADARS , Doppler RADAR, INS, GPS.

AIRCRAFT ELECTRICAL SYSTEMS:

07 Marks

General requirements of Aircraft electrical system, types of wires, cables used in aircraft, methods of routing of electrical wires/cables, cable termination methods, electrical bonding, need for bonding, types of switches, relays, contactors, types of fuses, circuit breakers, bus bars, power conversion equipments, aircraft internal and external lighting system, airfield lighting system, PAPI (Precision Approach Path Indicator).

6 AIRCRAFT MAINTENANCE MANAGEMENT AND MANUFACTURING TECHNOLOGY

AIRCRAFT MAINTENANCE MANAGEMENT:

10 Marks

Failure Analysis-Concepts of failure, Early failures, Chance failures, Wear out failures, bath tub curve, Catastrophic failures, Degradation failures, Independent failures, Secondary failures, Reliability Analysis- Reliability concepts, Failure rate, MTBF, MTTF, MTTR Hazard rate, areas of reliability, Life testing and reliability, Classification of life testing, Maintainability and availability, Factors affecting maintainability, Objectives of maintenance, Forms of maintenance, Out sourcing, Built in test equipment(B I T E), Total productive maintenance(TPM), Prophylactic maintenance, Condition monitoring, Predictive maintenance, Vibration monitoring and control, Computerization of aircraft basic data maintenance, Ergonomics, Ergonomical reasons for layout of display panels ,various components/assemblies in an aircraft, ergonomics for decision making, management information system(MIS),environmental management: global environmental issues, ozone layer depletion, regulation on pollution and prevention, function of pollution board , environment act 1986.

MANUFACTURING TECHNOLOGY:

10 Marks

Metal Removal Processes, Types Of Machine Tools – Theory Of Metal Cutting: Machinability of metal. Cutting Tool- Classification of cutting tools- Cutting Tools Materials

Centre Lathe- Various Operations, Taper Turning Methods, Thread Cutting operation, Lathe Attachments & Accessories. Drilling operations- Jigs and Fixtures- Clamping devices- Milling-Classification, - Milling cutters and classification- milling processes- Milling operations..

Types Of Grinding Processes – Cylindrical Grinding, Surface Grinding, Centre less Grinding–Super finishing process- Honing, Lapping,

Sheet metal operations like bending , forming , punching, slitting ,embossing, louvering, drawing, deep drawing. Introduction to various types of press and press tools

Casting process types. Welding, classification welding, types of welding, brazing, soldering Electron Beam Machining, Laser Beam Machining, Electric Discharge Machining, Introduction to CNC machines.

7. Helicopter Basics:


10 Marks

Various configurations of helicopter. Various controls, rotors and engines with their type currently in use of helicopter Understanding the concept of Relative Wind Blade Pitch Angle Powered Flight and its aerodynamics Hovering flight and its aerodynamics Coning of Main rotors Principle of Gyroscopic Precession Concept of Ground effect during Hovering(OGE and IGE)Vertical Flight and its relation with Collective Pitch Translational Flights and aerodynamic forces Forward Flight Sideward Flight Rearward Flight Turning Flight methods of tilting Rotor Disc Concept of Auto Rotation concept of Flapping, Feathering and Lead lag Vibration in

Helicopters Groups of Vibrations and definition , Sources of Vibration ,Ways and methods to Overcome vibrations Concept of Torque Reaction and Directional control Balancing torque reaction Tail rotor and its pitch change mechanism Main Structural components of helicopter their types, material, purpose and location Fuselage (cabin, centre section, tail boom) Stabilizer Landing gears Types of gear box – bevel, helical, spur, worm, planetary gear box Tail rotor gear box – need for tail rotor gear box ,pitch change mechanism Main mechanical systems their construction ,purpose and location , Transmission system Main gear box Tail gear box, Clutch, Freewheeling unit Main rotor head Main Flight Control Systems their purpose, construction and location Collective Pitch Control Throttle Control ,Governor ,Cyclic Pitch Controls Anti torque pedals Swash plates Hydraulic System ,Purpose components and their function

Fuel Systems Fuel supply System Lubricating system ,its purpose and functioning

Introduction to sources of power and its major components Introduction to Starting systems and its major items Introduction to Lighting systems.


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ANNEXURE-X

DIPLOMA IN MINING ENGINEERING

Total Marks:100

1. Mine Environment and Ventilation.

(20 MARKS)

Cooling power and the instrument to find cooling power. Normal air composition, Physical, Chemical and Physiological effects of following gases: Oxygen, Nitrogen, Carbon dioxide, Black damp, White damp, Stink damp, Firedamp. Different gas detectors and detector tubes. Down cast, up cast, Homotropical, Antitropical, and Assentional and Discentional ventilation. Flame safety lamp (FSL) and its safety aspects. The procedure of finding accumulation and percentage of methane by using a FSL. Barometer, Aneroid barometer, Manometer and inclined manometer and Pitot tube. The procedure of using the following velocity measuring instruments (a) Smoke and dust method. (b) Anemometer. Self-contained breathing apparatus, Gas mask, Self-rescuer used in mines, Portable type Fire fighting equipments.

2. Geology and Rock Mechanics

(20 MARKS)

Definition of Geology and its branches. Weathering and its types. Physical properties of Minerals. Folds, Faults & Joints. Igneous, Sedimentary and Metamorphic Rocks. Textures, Structures. Maps & its types. Ore Mineral, Gangue Mineral & tenor of Ore. Process of formation- Magmatic, Hydrothermal & Mechanical Concentration. Hydrology: Zone of Saturation, Zone of Aeration. Aquifer, Aquifuge & Aquiclude. Importance of Rock Mechanics: Problems and application of rock mechanics. Physical properties of rocks: Porosity, Density, Water content, Permeability, Thermal and electrical properties, Anisotropy and durability. Mechanical properties of rocks: Compressive, Tensile, Shear, point load and Flexural strength. Elasticity, Plasticity, Poisson's ratio, Young's modulus, Deformability, Stress strain graph, Hardness, Mohr's scale of Hardness. Ground vibration: Prediction and control measures. Improvement of rock mass properties: Grouting, Methods of grouting, Rock bolts and types, Rock mass classification and slope stability

3. Mine Legislation and General Safety;

(20 MARKS)

Mine Act 1952: Meaning of the terms, Mine Act, Regulations, Rules, Bye-laws, standing orders, and situations under which act does not apply. Provisions of Mines Act in respect of Drinking water health and hygiene conservancy, Medical appliances, hours and limitation of employment - Leave with wage

Mines Rules 1955: Mine rules related to drinking water, lavatories, and urinals with on surface and in Underground first aid.

Coal Mines Regulations 1957/ Metalliferous Mines Regulations 1961:

Regulations related to motive of accidents, Duties of managers, Asst/under Managers. Overman, foreman and surveyor, Mine plans and Sections, Means of Access and egress, ladder and ladder ways, Transport of men and material-winding in shafts, Haulage, Mine working, Precautions against dangers from fires dust, gas and water.

General Safety in Mines: Classification of accidents causes for accidents, accident preventive measures, Inspection of accidents, Investigation of accidents, Accident enquiry reports. Notified miner's diseases, occupational health survey, preventive measures, permissible Standard of dusts and threshold values (T.L.V.)

4. Method of Working-Opencast and Underground (20 MARKS)

Quarriable limits, design of benches (Manuel and mechanised). Slope stability. Common drilling and blasting methods used in open cast mining. Explosives used in open cast mining such as ANFO, LOX, slurry and emulsion. Magazine. Bucket wheel excavator, Dipper shovel, ripper, bulldozer, dragline and scrapper.

Underground Mining; Shaft, adit, drive, crosscut, bin, and stope , shapes of shafts: Vertical shaft, Incline shaft, compound shaft and Adit. Reef drive, Foot wall drive. Sub level stoping , cut and fill, shrinkage stoping. Special method of shaft sinking: Piling method of shaft sinking, Caisson method of shaft sinking, Cementation method, Freezing method of shaft sinking. Dome's theory, Prediction of rock burst, The measures to control rock burst. Coal Mining: Definition of terms Galleries, Pillar, Goaf, Drift, Heading, Face, Cross- Cut, Panel, Barrier. Height of Gallery, width, position, shape, pillar size and panel. Long wall mining method (advancing and retreating). Basic terminology of long wall face like Face, Gate, Tailgate, Goaf line. Subsidence; subsidence factor, angle of draw, critical width, Critical area, sub critical area, super critical area factors affect the subsidence. General principles of underground coal gasification. Definition of Feed .

5. Mine surveying; (20 MARKS)

Compass Surveying: Introduction and purpose, Bearing & its type, Problems on bearings, Compass and its type, Dip and declination, Open and closed traverse, checks.

Levelling: Terms used in levelling, Bench marks, Temporary adjustments of level , Concept of B.S, I.S, F.S, C.P, H.I, Simple levelling and differential levelling.

Levelling application: Different types of levelling – fly levelling, check levelling, profile levelling, cross sectioning, plotting of longitudinal and cross section, Contouring: Concepts of contour and terms used in contouring, characteristics of contour, uses of contours, Methods of contouring, Interpolation by arithmetical method, calculation of capacity of the reservoir

Theodolite surveying: Component parts, different terms, Temporary adjustment of Theodolite. Measurement of horizontal angles and vertical angles, Traversing with theodolite . Checks for closed and open traverse. Traverse computation-latitude, departure, closing error, balancing the traverse by Bowditch's rule and Transit rule.

Triangulation survey: well-conditioned triangle, consideration for the selection of Triangulations station, Corrections required in the base line measurement.

Tachometry: Principles of Tachometry- Determination of stadia constants, elevations and distances by stadia Tachometry with staff held vertical and line of collimation horizontal and inclined, Tangential Tachometry – finding the elevations and distances all the three cases.

Modern Surveying Instruments: Global Positioning System (GPS) - Fundamentals. GPS receivers, GPS observations, transformation of GPS results, working principles of GPS navigator. Modern Surveying Instruments- Principles and uses of (i) Electronic Theodolite (ii) EDM (iii) Total station.



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ANNEXURE-XI

ENGINEERING MATHEMATICS AND APPLIED SCIENCE

(COMMON TO ALL BRANCHES)

ENGINEERING MATHEMATICS

Max Marks : 40

Marks

LINEAR ALGEBRA

Unit-1: MATRICES & DETERMINANTS:

06 Mark

Basic concepts of Matrices (Addition, Subtraction and Multiplication), Determinants: Problems on finding unknown quantity in a 2nd and 3rd order determinants using expansion. Solving simultaneous linear equations using determinant method (Cramer's rule up to 3rd order).

Matrices: Minors, Cofactors, Adjoint and Inverse of matrices of 2nd order. Characteristic equation and roots of a square matrix.

ALGEBRA

Unit-2: VECTORS:

03 Marks

Magnitude of a vector. Position vector. Expression of vector in terms of position vectors. Vector in plane and in space in terms of unit vectors i, j and k respectively. Product of vectors. Scalar and vector product. Applications of dot and cross products i.e., Projection of vector on another vector, Area of parallelogram and area of triangle. Work done by a force and moment of force.

Unit-3: PROBABILITY:

01 Marks

Random Experiments, Sample Space, Events, Types of Events, Algebra of Events, Complementary event, the events A or B , A and B , A but not B , Mutually Exclusive Events, Exhaustive events, Simple problems.

TRIGONOMETRY

Unit-4: ALLIED ANGLES AND COMPOUND ANGLES:

06 Marks

Signs of Trigonometric ratios, Trigonometric ratios of Allied Angles in terms of θ . Formulae for $\sin(A \pm B)$, $\cos(A \pm B)$ & $\tan(A \pm B)$ and problems on them. Multiple and sub multiple angle formulae for $2A$ & $3A$ and simple problems. Transformation formulae on sum or difference into products & products into sum or difference and problems on them.

Unit-5: Complex numbers:

01 Mark

Definition of complex number in the form of $a + ib$. Conjugate of complex number. Algebra of complex numbers, modulus and principal value of argument of complex number. Polar form $Z = r(\cos\theta + i\sin\theta)$.

INTRODUCTION TO CALCULUS

Unit-6: Limits:

03 Marks

Evaluation of limit of functions by factorization, rationalization, limits when $n \rightarrow \infty$. Problems on algebraic limits based on formula $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = n \cdot a^{n-1}$. Problems on trigonometric limits based on formula $\lim_{\theta \rightarrow 0} \frac{\sin\theta}{\theta} = 1$.

CO-ORDINATE GEOMETRY

Unit-7: Straight Lines:-

02 Marks

Problems on different forms of equations of straight lines such as:

$$y = mx+c, (y-y_1) = m(x-x_1), (y-y_1) = \frac{y_2-y_1}{x_2-x_1} \cdot (x - x_1)$$

Problems on equation of lines through a point and parallel or perpendicular to a given line. Finding Slope ,X-intercept and Y- intercept of general equation $ax + by + c = 0$.

DIFFERENTIATION

Unit-8:

06 Marks

Problems on rules of differentiation: (Sum rule, product rule and quotient rule). Problems on function of a function and inverse trigonometric functions. Derivative of implicit functions, and parametric functions and problems. Successive differentiation up to second order and problems on them. Differentiation of Logarithmic functions of types u^v , Where u and v are functions of x, Simple problems.

APPLICATIONS OF DIFFERENTIATION

Unit-9:

02 Mark

Equations of tangent and normal to the curve $y = f(x)$ at a given point and problems. Derivative as a rate measure i.e.to find the rate of change of displacement, velocity, radius, area, volume using differentiation and problems on them.

INTEGRAL CALCULUS

Unit-10:

05 Marks

Rules of integration and problems. Problems on integration by the method of substitution and by parts.

DEFINITE INTEGRALS

Unit-11:

02 Mark

Simple problems on definite integrals. Problems on applications of definite integrals such as area and volume.

DIFFERENTIAL EQUATIONS

Unit-12:

03 Mark

Order and Degree of Differential Equations, Formation of differential equation by eliminating arbitrary constants up to second order. Problems on solution of linear differential equations of first order by variable separable method and integrating factor method.

APPLIED SCIENCE

Max. Marks: 40 Marks

UNIT-I MECHANICS:

07 Marks

Units : Unit ,types of units, SI unit- Basic and Supplementary units, advantages

Measuring instruments: Vernier calipers-principle and least count. Screw gauge-principle, ZE, ZC, pitch and least count- simple problems on vernier calipers and screw gauge.

Scalars and vectors: scalar and vector with example, resultant, equilibrium, equilibrant. Laws of vectors-parallelgram law of vectors, triangle law of vectors, Lami's theorem. Expression for magnitude and direction of resultant of two vectors acting at a point. Rectangular component of resolution of a vector-simple problems on laws of vectors.

Parallel forces: Types of parallel forces, moment of force, couple, moment of couple, simple problems on moment of force.

UNIT-II PROPERTIES OF SOLIDS AND LIQUIDS:

07Marks

Properties of solids: Deforming force, elasticity and plasticity with examples, stress and its types with example, strain and its types with example, Hooke's Law, Modulus of elasticity and its types- simple problems on stress and strain.

Properties of Liquids: Thrust and pressure, expression for pressure at a point inside the liquid at rest-simple problems.

Surface tension: Cohesive and Adhesive forces with examples, surface tension, factors affecting surface tension, application of surface tension. Capillarity and its applications.

Viscosity: viscosity, expression for coefficient of viscosity, effect of temperature on viscosity of liquid and gas, applications of viscosity- simple problems on coefficient of viscosity.

UNIT-III HEAT AND PROPERTIES OF GASES:

05 Mark

Concept of Heat and Temperature: Heat and Temperature, Specific Heat of substance,

Transmission of Heat: conduction, convection and radiation with example, Applications of conduction and convection and radiation.

Gas laws: Boyle's law, Charles's law and Gay-Lussac's law (statement with expression), expression $PV=nRT$, C_p and C_v and its relation-simple problems on gas laws.

UNIT-IV WAVE MOTION:

08Marks

Simple Harmonic Motion: Periodic motion with example, SHM, expression for displacement of a particle executing SHM.

Wave: Wave motion, wave period, wave frequency, wave amplitude, wave length and wave velocity, relation between wave frequency, wave length and wave velocity-problems on $V=n\lambda$. Mechanical waves and Non-Mechanical waves with examples, Longitudinal and Transverse waves with example.

Propagation of sound waves in air: Newton - Laplace's formula for velocity of sound in air and various factors affecting velocity of sound in air.

Vibrations: Free vibration, forced vibration and resonance with example. Laws of transverse vibration of stretched string, expression for fundamental frequency of vibration of stretched string -simple problems on fundamental frequency.

Stationary waves: Stationary waves and its characteristics, beat, beat frequency, application of beats.

UNIT- V MODERN PHYSICS:

05 Mark

Electromagnetic waves : Electromagnetic waves and its properties, electromagnetic spectrum and its applications.

Laser: Laser, properties of laser and its applications.

Nano-technology: Nanotechnology, advantages and dis-advantages of nanotechnology.

Communication system: Basic elements of communication system, advantages and dis-advantages of satellite communication system,

Optical fibre: Optical fibre-principle and its applications.

UNIT-VI INDUSTRIAL CHEMISTRY

08 Marks

Electrolysis: Electrolyte, types of electrolyte with example, electrolysis, Postulates of Arrhenius theory of electrolytic dissociation, Faraday's First and Second law of electrolysis-simple problems on Faraday's laws.

Corrosion: Corrosion, conditions for corrosion, preventive methods of corrosion.

Batteries: Battery, classification and its application.

Fuel cells: Fuel cell, types and advantages of fuel cells.

Metallurgy: Definition of mineral, ore, flux, slag and alloys. Purpose of making alloys and its applications.

Polymers: polymers and its types, application of polymers.

Composite materials: Composite material and its types, advantages and dis-advantages of composite material.

pH Value: pH value of a solution , pH scale, application of pH in different fields.



(S. Venkatesh)

Under Secretary to Government
Higher Education (Technical Section)

