ಕರ್ನಾಟಕ ಸರ್ಕಾರ
ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ಇಲಾಖೆ

ಸಂಖ್ಯೆ: ತಾಂಶಿನಿ 36 ಸಿಡಿಸಿ(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

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.

ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ನಡವಳಗಳು

ವಿಷಯ:- 2018ರ ಸಾಲಿನಿಂದ ಡಿಪ್ಲೊಮಾ 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 ಸಿಡಿಸಿ (1) 2017-18/2910, ದಿನಾಂಕ:30-01-2018.

ಪ್ರಸ್ತಾವನೆ:-

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

ಮೇಲೆ ಕ್ರಮಸಂಖ್ಯೆ (2), (3) ಮತ್ತು (4)ರಲ್ಲಿ ಓದಲಾದ ಸರ್ಕಾರದ ಆದೇಶಗಳಲ್ಲಿ ರಾಜ್ಯದಲ್ಲಿನ ಎಲ್ಲಾ ಪಾಲಿಟೆಕ್ನಿಕ್‌ಗಳ ಡಿಪ್ಲೊಮೊ 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 ಡಿಪ್ಲೊಮೊ ಸೆಮಿಸ್ಟರ್‌ಗಳ ಪಠ್ಯಕ್ರಮಗಳಲ್ಲಿ " ಫಲಿತಾಂಶದ ಆಧಾರಿತ ಪಠ್ಯಕ್ರಮ (Outcome Based Education)" ಪದ್ಧತಿಯನುಸಾರ ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳನ್ನು 2015-16ನೇ ಸಾಲಿನಿಂದ ಅಳವಡಿಸಲಾಗಿದ್ದು, ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳ ಪ್ರಕಾರ ಪ್ರವೇಶ ಪಡೆದ ಡಿಪ್ಲೊಮಾ ವಿದ್ಯಾರ್ಥಿಗಳು 2018ನೇ ಸಾಲಿನಲ್ಲಿ ಡಿಪ್ಲೊಮಾ ವ್ಯಾಸಂಗವನ್ನು ಮುಗಿಸಲಿದ್ದು, ಆಸಕ್ತ ಅರ್ಹ ಡಿಪ್ಲೊಮಾ ಅಭ್ಯರ್ಥಿಗಳು ಬಿ.ಇ (ಲ್ಯಾಟರಲ್ ಎಂಟ್ರಿ) ವ್ಯಾಸಂಗ ಮುಂದುವರೆಸಲು, ಕರ್ನಾಟಕ ಪರೀಕ್ಷಾ ಪ್ರಾಧಿಕಾರ ನಡೆಸುವ 2018ರ ಸಾಲಿನ DCET ಪರೀಕ್ಷೆಗಳನ್ನು ತೆಗೆದುಕೊಳ್ಳಬೇಕಾಗಿರುತ್ತದೆ. ಆದ್ದರಿಂದ 2018ರ ಸಾಲಿನ ಡಿಸಿಇಟಿ ಪರೀಕ್ಷೆಗಳಿಗೆ 2015-16ನೇ ಸಾಲಿನಿಂದ ಡಿಪ್ಲೊಮೊ ವ್ಯಾಸಂಗದಲ್ಲಿ ಅಳವಡಿಸಿರುವ "ಫಲಿತಾಂಶದ ಆಧಾರಿತ ಪಠ್ಯಕ್ರಮ (Outcome Based Education)" ಪದ್ಧತಿಯ ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಅಳವಡಿಸಬೇಕಾಗಿರುತ್ತದೆ.

-2

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 ಸಮಿತಿಯ ಹೊಸ ಪಠ್ಯಕ್ರಮಗಳಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳು ಕಲಿತಿರುವ ತಾಂತ್ರಿಕ/ಜ್ಞಾನವನ್ನು 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

(ಗಣಿತದಲ್ಲಿ 40 ಅಂಕಗಳು ಹಾಗೂ ವಿಜ್ಞಾನದಲ್ಲಿ 40 ಅಂಕಗಳು)

ಸದರಿ ಪ್ರಸ್ತಾವನೆಯನ್ನು ಕೂಲಂಕಷವಾಗಿ ಪರಿಶೀಲಿಸಿ, ಈ ಕೆಳಕಂಡಂತೆ ಆದೇಶಿಸಿದೆ.

ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 23 ಟಿಪಿಇ 2018.

ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 03ನೇ ಏಪ್ರಿಲ್ 2018.

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

ಕರ್ನಾಟಕ ರಾಜ್ಯಪಾಲರ ಆದೇಶಾನುಸಾರ
ಮತ್ತು ಅವರ ಹೆಸರಿನಲ್ಲಿ,

(ಸಹಿ)

(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.

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, Polytrophic, 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

REFERENCES

Sl. No	Contents	Reference Books
1	Manufacturing Technology	1. Rao, P.N., *Manufacturing Technology, Vol I & II*, Tata Mcgraw Hill Publishing Co., New Delhi, 1998 2. Seropekalpakjian, Steven R Schmid *Manufacturing Engineering and Technology*- Pearson Education-Delhi 3. Sharma, P.C., *A Textbook Of Production Technology – Vol I And II*, S. Chand & Company Ltd., New Delhi, 1996 4. HMT – *"Production Technology"*, Tata Mcgraw-Hill, 1998 5. *Elements of Workshop Technology* Vol-I&II Manufacturing Process edition-By Hajra Choudry 6. K.R.Gopalakrishna "Engineering Drawing" (Vol. I & II). Subhas Publications, 2014
2	Strength of Materials and Theory of Machines	1. Ramamurtham. S., *"Strength of Materials"*, 14th Edition, Dhanpat Rai Publications, 2011 2. Khurmi R S, *"Applied Mechanics and Strength of Materials"*, 5 Edition, S.Chandand company 3. Popov E.P, *"Engineering Mechanics of Solids"*. 2nd Edition, Prentice-Hall of India, New Delhi, 2002. 4. Nash W.A, *"Theory and problems in Strength of Materials"*, Schaum Outline Series, McGraw-Hill Book Co., New York, 1995. 5. Kazimi S.M.A, *"Solid Mechanics"*, Tata McGraw-Hill Publishing Co., New Delhi, 2003. 6. Ryder G.H, *"Strength of Materials"*, 3rd Edition, Macmillan India Limited, 2002. 7. Bansal R. K, *"Strength of Materials"*, Laxmi Publications, New Delhi, 2012. 8. Timoshenko S.P, *"Elements of Strength of Materials"*, Tata McGraw-Hill, Delhi,
3	Thermal Engineering	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	1. Bansal. R.K.,*"Fluid Mechanics and Hydraulics Machines"*, 9th Edition, Laxmi Publications Private Limited, New Delhi. 2011. 2. R.S.Khurmi, *"Fluid Mechanics and Machinery"*,S.Chand and Company, 2nd Edition, 2007. 3. *Hydraulics & Pneumatics* – Andrew Parr, Jaico Publishing. House New Delhi. 4. *Hydraulic and Pneumatic Controls Understanding Made Easy*- K.S.Sundaram,-S.chand Company Delhi

5	Management	1. Industrial Organization and Engineering Economics T.R.Banga & S C Sharma
		2. Khanna Publishers
		3. Industrial management and organizational behavior K.K.Ahuja
		4. Industrial management and engineering economics O.P.khanna Khanna publishers
		5. Production and operations management -Dr .K.Aswathappa and Dr.Sreedhar Bhatt Himalaya publishers
		6. Safety Management in Industry Krishnan.N V Jaico Publishing House, Bombay, 1997
		7. Total Quality Management S Raja Ram, Shivashankar
6	Material science and Measurements	1. *Engineering Materials* by Er.R.K.RAJPUT of S.CHAND Publications
		2. *Mechanical Engineering Measurement* - Thomas Beckwith, N.Lewis Buck, Roy Marangoni - *Narosa Publishing House, Bombay*
		3. *Mechanical Engineering Measurements* - A. K. Sawhney - *DhanpatRai& Sons, New Delhi.*
		4. *"Engineering Metrology"* by R.K.Jain, Khanna Publishers, 1994

(S.Venkatesh)
Under Secretary to Government
Higher Education (Technical Section)

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, feed back 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. Electrodynamometer –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 invertor, 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. ProgrammingPLC-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, PassiveFilters 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, Geostationaryand 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, GSMA/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, Identifiersand 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, Identifiersand 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.

A.Venkatesh

(S.Venkatesh)
Under Secretary to Government
Higher Education (Technical Section)

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 synchronoscope, 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. TRANSMISION 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, Lighting 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 (Sulpher 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, qualities 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, UG service Mains, current ratings for Aluminium, copper conductors, Types of Towers, ACSR conductor 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, application s 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.

(S.Venkatesh)
Under Secretary to Government
Higher Education (Technical Section)

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.

(S.Venkatesh)

Under Secretary to Government
Higher Education (Technical Section)

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 pining, 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.

(S.Venkatesh)
Under Secretary to Government
Higher Education (Technical Section)