

Total No. of Questions :6]

SEAT No. :

P79

BE/Insem./APR-118

[Total No. of Pages : 2

B.E. (Mechanical & Mech. S/W)

402048 : MECHANICAL SYSTEM DESIGN

(2012 Course) (Semester - II)

Time : 1½ Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1) a) Explain in brief basic considerations in design of multi-Speed gear box. [4]
b) State and explain the parameters used in kinematic design of gearbox. [6]

OR

- Q2) A multi speed gear box is to be designed for a small size general purpose machine tool for spindle speeds varying between 63 r.p.m. and 630 r.p.m. If the recommended geometric progression ratio is as per R5 series Draw the structure diagrams for machine tool gear box. Select the optimum structure diagram. If the gear box is to be driven 720 r.p.m. three-phase A.C. motor through a belt drive, determine the ratio of belt pulley diameters. [10]

- Q3) a) Explain design and natural tolerances. [4]
b) Define the following terms: [6]

- i) Population
- ii) Sample
- iii) Random variables

Also explain the concept of reliability based design.

OR

- Q4) A particular type of rolling contact bearing has a normally distributed time to failure with a mean of 10000 hours and a standard deviation of 750h. If there are 100 such bearings fitted at a time, how many may be expected to fail within the first 11000h? [10]

| z | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1.1 | 0.3643 | 0.3665 | 0.3686 | 0.3708 | 0.3729 | 0.3749 | 0.3770 | 0.3790 | 0.3810 | 0.3830 |
| 1.2 | 0.3849 | 0.3869 | 0.3888 | 0.3907 | 0.3925 | 0.3944 | 0.3962 | 0.3980 | 0.3997 | 0.4015 |
| 1.3 | 0.4032 | 0.4049 | 0.4066 | 0.4082 | 0.4099 | 0.4115 | 0.4131 | 0.4147 | 0.4162 | 0.4177 |
| 1.4 | 0.4192 | 0.4207 | 0.4222 | 0.4236 | 0.4251 | 0.4265 | 0.4279 | 0.4292 | 0.4306 | 0.4319 |

P.T.O.

- Q5) a) Differentiate between Angle of Repose and Surcharge Angle? [4]

- b) A flat horizontal belt conveyor is to be used for transporting material with mass density of 3 ton/m³. The belt is 750mm wide and has speed of 2.75 m/s. Determine capacity of conveyor if surcharge angle is 25° (k = 2.35*10⁻⁴). [6]

OR

- Q6) Derive the expression for frictional force between the belt and carrying run idler and between belt and return run idler. [10]

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