BE/Insem/APR.-169
B.E (Mechanical S/W)
MECHANICAL SYSTEM DESIGN
(2015 Pattern) (Paper - II) (402048)

Time : 1½ Hours] *[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 indicate full marks.*
4) *Assume Suitable data if necessary.*

Q1) a) In multi speed gear box, geometric progression ratio is selected in the range of 1 to 2. Justify. **[4]**

   b) Draw the systematic structure diagrams and identify the optimum structure diagram for the following structural formulae: **[6]**

   i) z = 2(1) 2(2) 3(4)

   ii) z = 2(1) 2(6) 3(2)

   iii) z = 2 (2) 2(1) 3(4)

OR

Q2) A nine speed sliding mesh gear box, based on R5 series is to be designed for a machine tool drive for the speeds starting from 120 rpm. If the gear box is driven by a motor of running at 1440 rpm throught belt drive. **[10]**

   a) List out all the speeds for a proposed gearbox

   b) Write all the structural formulae

   c) Draw speed ray diagram

   d) Daw Kinematic diagram of the gearbox.

Q3) a) Give the comparison between normal distribution and standard distribution curves? **[4]**

b) It has been observed from a sample of 200 bearing bushes that the internal diameters are normally distributed with a mean of 40.010 mm and a standard deviation of 0.005 mm. The upper and lower limits for the internal diameter are 40.02 and 40.00 mm. respectively. Calculate the number of rejected bushes. **[6]**

z	1	1.2	1.4	1.6	1.8	2	2.2	2.4	3
Area	0.3413	0.3849	0.4192	0.4452	0.4641	0.4772	0.4861	0.4918	0.4987

OR

Q4) A straight tensile bars of diameter 10 ± 0.1 mm are made of plain carbon steel 40C8 having tensile yield strength of 300 ± 30 N/mm². The load on the bars is 23.5 ± 5KN, if the diameters, strength and loads are normally distributed, estimate the reliability of withstanding the load by the bars. the areas under the standard normal distribution curve from 0 to Z are as follows. **[10]**

z	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
area	0.3413	0.3849	0.4192	0.4452	0.4641	0.4772	0.4861	0.4918

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

b) Explain the following with required formula in belt conveyor. **[6]**

Resistance load due to lifting of the material.

Resistance due to frictional forces at carrying and return run idlers.

Frictional resistance at Pulleys.

Resistance at loading stations

Resistance at unloading stations

Resistance due to belt cleaning stations

Estimated power requirements of belt conveyor.

OR

Q6) An inclined 3 ply belt conveyor transporting 1.5 ton per hour at a speed of 75 m/min, with horizontal distance of traverse 900m and height 300m. The mass density of material is 2.5 Ton/m³ and speed of electric motor is 1500rpm. Calculate: **[10]**

Width of belt

Diameter of Drive pulley

Gear box reduction ratio

Conveyor inclination	10º-15º	16º-20º	21º-25º	26º-30º
Flow-ability factor	2.65×10^4	2.5×10^4	2.35×10^4	2.2×10^4

Assume material factor for plies, $K_1 = 2.5$ and

Factor for belt tension and arc of contact, $K_2 = 80$.

Standard Belt widths (mm)

300, 400, 450, 500, 600, 650, 750, 800, 900, 1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400.

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