

II B.Tech. II Semester Regular Examinations May 2015

Manufacturing Technology
(Mechanical Engineering)**Max. Marks: 70****Time: 03 Hours**

Answer any five questions

All Questions carry equal marks (14 Marks each)

1. a) Explain with neat sketches the steps involved in making green sand mould using split pattern? 7M
b) What is permeability and why is it important in moulding sand? 7M
2. a) What is the difference between the solidification of pure metals and metal alloys? 7M
b) Describe the working of a centrifugal casting and explain its advantages and disadvantages? 7M
3. a) Classify various welding processes and state the advantages, limitations and applications of electric ARC welding? 7M
b) Describe the principle of gas cutting? How the cutting tip differ from the welding tip. 7M
4. a) Explain the principle, applications, advantages and limitations of TIG welding? 8M
b) Explain any three Non-Destructive testing methods used for finding the casting defects? 6M
5. A 450 x 25 mm strip is fed through a rolling mill with two powered rolls of radius 350mm. the strip thickness is to be reduced to 20mm in one pass at a roll speed of 60 rev/min. Yield strength of strip material is 175N/mm². Determine
(a) Coefficient of friction
(b) Roll force
(c) Power 14M
6. a) Explain the effect of spring back? How is it compensated? 4M
b) Explain in detail the working of a stretch forming and V-bending process? 10M
7. a) Differentiate cold and hot extrusion process? 7M
b) Explain in detail hydrostatic extrusion process? 7M
8. Write a short notes on any TWO of the following
(a) Abrasive jet machining
(b) Electro chemical machining
(c) Laser beam welding/machining 14M

Probability and Statistics
(Common to CE, ME & IT)

Max. Marks: 70

Time: 03 Hours

Answer any five questions

All Questions carry equal marks (14 Marks each)

1. a) Find the mean, median and mode for the following:

Mid Value	15	20	25	30	35	40	45	50	55
Frequency	2	22	19	14	3	4	6	1	1

7M

- b) Find the rank correlation for the following data.

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

7M

2. a) A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C 3 times in 4 shots. They fire a volley. What is the probability that (i) two shots hit, (ii) at least two shots hit? 7M
- b) There are three bags: first containing 1 white, 2 red, 3 green balls, second 2 white, 3 red, 1 green ball and third 3 white, 1 red, 2 green balls. Two balls are drawn from a bag chosen at random. These are found to be one white and one red. Find the probability that the balls so drawn came from the second bag. 7M

3. a) A random variable X has the following distribution

X	1	2	3	4	8	9
P(x)	k	3k	5k	7k	9k	11k

Determine (i) k (ii) mean (iii) $P(X) \geq 3$

7M

- b) If X is a continuous random variable and K is a constant then prove that (i) $V(X+K) = V(X)$ (ii) $V(XK) = K^2V(X)$ 7M
4. a) The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that (i) exactly two will be defective. (ii) at least two will be defective. (iii) none will be defective. 7M
- b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution. 7M
5. Determine the mean and standard deviation of sampling distribution of variances for the population 3, 7, 11, 15 with $n = 2$ and the sampling is with replacement. 14M
6. a) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487/- with a standard deviation of Rs. 48/-. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 472 and 502? 7M
- b) If we can assert with 99% that the maximum error is 0.16 and P is 0.3, find the size of the sample. 7M
7. a) A sample of 900 members is found to have a mean of 3.4 cm, Can it be reasonably regarded as a truly random sample from a large population with mean 3.25 cm and standard deviation 1.61 cm. 7M
- b) From a random sample of 10 pigs fed on diet A, the increases in weight in a certain period were 10, 6, 16, 17, 13, 12, 8, 14, 15, 9 lbs. For another random sample of 12 pigs fed on diet B, the increase in the same period were 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17 lbs. Test whether diets A and B differ significantly as regards their effect on increases in weight? 7M
8. a) A manufacturer claims that only 4% of his products are defective. A random sample of 500 was taken among which 100 were defective. Test the hypothesis at 0.05 level. 7M
- b) If 57 out of 150 patients suffering with certain disease are cured by allopathy and 33 out of 100 patients with same disease are cured by homeopathy, is there reason to believe that allopathy is better than homeopathy at 0.05 level of significance. 7M

Thermal Engineering -I
(Mechanical Engineering)

Max. Marks: 70

Time: 03 Hours

Answer any five questions
All Questions carry equal marks (14 Marks each)

1. a) Briefly explain
 - i) Burning time loss factor
 - ii) Heat loss factor
 - iii) Exhaust blow down factor

7M
- b) Draw p-v diagram for air standard cycle for 4 stroke petrol engine and then show the effect on the same diagrams of fuel air cycle and actual cycle are considered.

7M
2. a) With a neat sketch explain Electronic fuel injection systems used in some modern cars?

7M
- b) Explain Magneto ignition system with a neat diagram? What are the requirements of a good spark plug?

7M
3. a) Explain ignition lag? Discuss the influence of operating variables on it?

7M
- b) Explain with neat sketches the combustion phenomenon in S.I. engines?

7M
4. a) C.I. Engines can accept very lean over all mixture ratios but S.I. engines cannot, explain and discuss?

7M
- b) Explain the effect of fuel/air ratio, injection advance and cetane number of fuel parameters on delay period in C.I. engines?

7M
5. a) What are the parameters to be find out during performance testing and heat balance of a 4-stroke twin cylinder diesel engine? Make a chart? Explain?

7M
- b) A 4-stroke 4-cylinder S.I. engine has the following data: Bore=6 cm, Stroke=9.3 cm, Speed=2800 RPM, Clearance volume=52.5 cm³, Relative efficiency based on brake thermal efficiency=50%, Heating value of the fuel=44.1 MJ/kg, When tested on load, it developed 58.9 N-m torque. Determine the specific fuel consumption and brake mean effective pressure. Assume mechanical efficiency=80% & $\gamma=1.4$ for air standard efficiency

7M
6. a) What are the advantages of multi stage compressors over single stage compressors? Derive the condition of minimum work with complete inter cooling in a two stage compressor?

7M
- b) A single stage, double acting air compressor has a free air delivery (FAD) of 14 m³/min measured at 1.013 bar and 15°C. The pressure and temperature in the cylinder during induction are 0.95 bar and 32°C. The delivery pressure is 7bar and the index of compression is 1.3. Calculate the indicated power and volumetric efficiency? The clearance is 5% of the swept volume.

7M
7. a) Explain the phenomenon of surging and choking in rotary compressors?

7M
- b) Find the limit of pressure ratio for a centrifugal compressor whose tip speed is limited to 450 m/s due to stress considerations. The stagnation inlet temperature is 297 K, the slip and power input factors are 0.9 and 1.01 respectively. Stagnation isentropic efficiency of the compressor is 0.81

7M
8. a) Sketch the characteristic curves of axial flow compressors and distinguish centrifugal and axial flow compressors?

7M
- b) A ten stage axial flow compressor of 50% reaction design has a mean blade velocity of 250 m/s and the blade inlet angle for each row is 45°. The ratio of flow velocity to blade velocity is 0.75, the work done factor for each stage is 0.87 and the isentropic efficiency of compressor is 0.85. Assuming an air inlet temperature of 20°C. Calculate i) exit angles of the blades ii) pressure ratio of compressor iii) pressure ratio for first stage. Take stage efficiency is equal to compressor polytrophic efficiency

7M

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Environmental Science
(Common to Civil, ME & CSE)**Max. Marks: 70****Time: 03 Hours**

Answer any five questions

All Questions carry equal marks (14 Marks each)

1. a) Define environment. Discuss the various segments of environment. 9M
b) Write briefly about the importance of Environmental studies. 5M
2. a) Discuss the role played by the non-conventional energy resources towards the protection of the environment. 7M
b) Explain dams and their effects on forests and tribal people. 7M
3. a) Discuss the changes caused by agriculture and overgrazing. 7M
b) Discuss the role of an individual in conservation of natural resources. 7M
4. Define pollution. Describe the sources, adverse effects and control measures of noise pollution. 14M
5. Write a brief note on
 - a) Food Chains 4M
 - b) Food webs 4M
 - c) Energy flow through an ecosystem 6M
6. a) Explain about threats to biodiversity. 8M
b) List the main biogeographic zones in India. 6M
7. Discuss briefly the provisions of the following Acts.
 - a) The water (Prevention and control of pollution) Act, 1974 5M
 - b) The Air (Prevention and control of pollution) Act, 1981 5M
 - c) The Forest conservation Act, of 1980. 4M
8. a) What is the role of information technology (IT) in environment and human health? 7M
b) Explain in detail about Women and Child welfare programme. 7M

Max. Marks: 70**Time: 03 Hours**

Answer any five questions

All Questions carry equal marks (14 Marks each)

1. a) Define the term metacentre and state its importance. 6M
 b) A shaft of diameter 75 mm rotates in a bearing of diameter of 95 mm and length of 125 mm. The annular space between the shaft and the bearing is filled with oil having coefficient of viscosity 0.16 strokes and specific gravity 0.9. Determine the power in overcoming viscous resistance in this bearing at 2000 rpm. 8M
2. a) From the fundamentals derive Euler's energy equation and from it deduce the Bernoulli's equation? State the assumptions involved in deriving the equation. 8M
 b) Difference between:
 - (i) Steady flow and unsteady flow
 - (ii) Uniform flow and non-uniform flow
 - (iii) Stream line and stream tube 6M
3. a) Two reservoirs with a level difference of 10 m are connected by two parallel pipes of 100 m length and diameter of 100 mm and 50 mm respectively. Assuming the friction factors for those two pipes to be 0.02 and 0.025 respectively. Calculate the total discharge through them. Also determine the diameter of a single pipe of length 100 m and friction factor 0.025 which will give the same discharge. 10M
 b) Write short note on turbine flow meter? 4M
4. a) Explain impulse momentum equation? 4M
 b) A jet of water of 50 mm diameter strikes a curved vane at its centre with a velocity of 20 m/s. The curved vane is moving with a velocity of 5 m/s in the direction of the jet. The jet is deflected through an angle of 160°. Assuming the plate to be smooth, calculate (i) Thrust on the plate in the direction of the jet, (ii) Power of the jet and (iii) Efficiency of the jet. 10M
5. a) Draw a neat diagram of storage type hydroelectric power plant and describe the function of each component used in the plant? 8M
 b) What is meant by catchment area? Define hydrology, hydrograph, flow duration curve and mass curve with reference to hydroelectric power plants? 6M
6. a) Explain the purpose of providing (i) scroll casing (ii) stay vanes (iii) guide vanes for a reaction turbine? 4M
 b) A Pelton wheel is required to develop 6 MW when working under a head of 300m. It rotates a speed of 550 rpm. Assuming jet ratio as 10 and overall efficiency as 85 %, calculate (i) diameter of wheel (ii) quantity of water required and (iii) number of jets. Take velocity coefficient and speed ratio as 0.98 and 0.46 respectively. 10M
7. a) What is a surge tank and write its functions? Describe with neat sketches different types of surge tanks? 4M
 b) A model of Francis turbine one-sixth of full size develops 3 kW at 320 rpm under a head of 1.5 m. Find the speed and power of the full size turbine operating under a head of 5m. (i) the model and full size turbine have the same efficiency (ii) the model turbine has an efficiency of 75% and scale effect is to be considered. 10M
8. a) A centrifugal pump impeller has diameters at inlet and outlet as 350 mm and 700 mm respectively. The flow velocity at outlet is 2.3 m/s and vanes are set back at an angle of 45° at the outlet. If the manometric efficiency is 75 percent, calculate the minimum starting speed of the pump. 10M
 b) List the factors which influence the speed of reciprocating pump? 4M

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Kinematics of Machinery
(Mechanical Engineering)

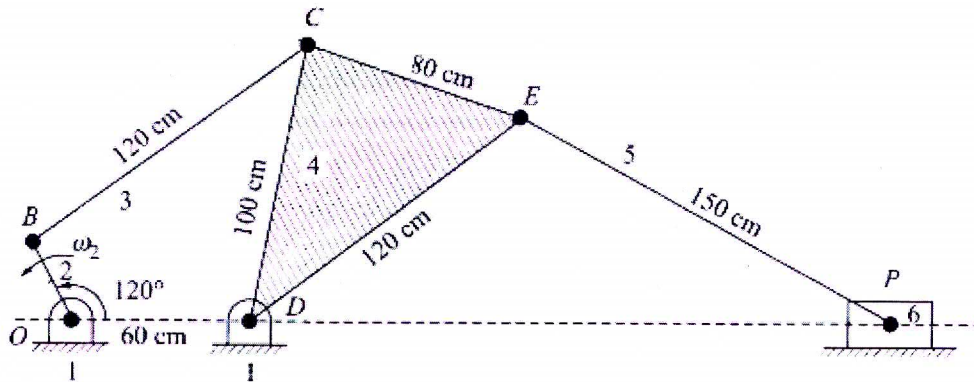
Max. Marks: 70

Time: 03 Hours

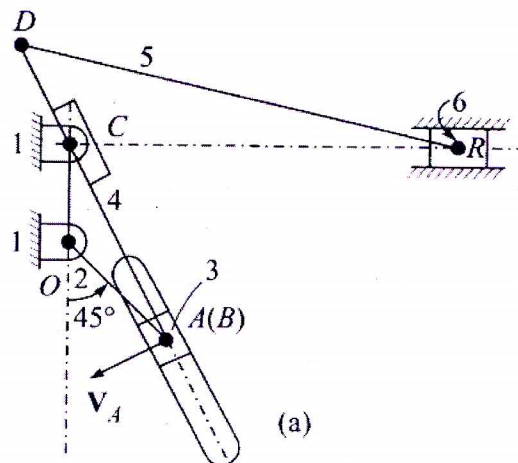
Answer any five questions

All Questions carry equal marks (14 Marks each)

1. a) Distinguish clearly between the concept of 'motion of a point' and 'motion of a rigid body.'
- b) Explain Grashof's criterion and describe any two inversions of 4-bar chain with suitable sketches.
2. a) What are straight line mechanisms? Derive the condition of exact straight line motion?
- b) In a Davis steering gear, the distance between the pivots of front axle is 1 m and the wheel base is 2.5 m. Find the inclination of the track arm to the longitudinal axis of the car when it is moving along a straight path.
3. a) State and prove the Kennedy theorem?
- b) For the mechanism shown in figure, find the velocities of points C, E and P and the angular velocities of links 3, 4 and 5. Crank OB is 30 cm long and rotates at 120 rpm ccw.



4. a) What is the importance of finding accelerations of various point in a mechanism?
- b) A Whitworth quick return motion mechanism is shown in figure below. OA is a crank rotating at 30 rpm cw. OA = 150 mm long; OC = 100 mm; CD = 125 mm and DR = 500 mm. Determine the acceleration of the sliding block R and the angular acceleration of the slotted lever CA.



5. The following data relate to a cam operation an oscillating roller follower:
- Minimum diameter of the cam = 44 mm; Diameter of roller = 14 mm
 - Length of the follower arm = 40 mm; Angle of oscillation of follower = 28°
 - Distance of fulcrum centre from cam centre = 50 mm
 - Angle of ascent = 75° ; Angle of descent = 105°
 - Angle of dwell for the follower in the highest position = 60°

Draw the cam profile if the ascent and descent take place with SHM

6. The gears wheels mesh externally and are to give a velocity ratio of 3. The teeth are of the involute form. Module pitch is 6.5 mm and addendum is equal to 1 module. Pressure is 18° . The pinion rotates at 100 rpm. Find
- The number of teeth in each wheel so that interference is just avoided.,
 - the number of teeth in contact,
 - the length of path and arc of contact,
 - maximum velocity of sliding between meshing teeth,
 - the angle of rotation of the pinion while any one pair of teeth is in contact,
 - The normal force between the mesh assuming that the pinion transmits 10 kW at 100 rpm also that there are two pairs of teeth in contact, total force being equally divided between the two pairs
7. An open belt drive connects two pulleys 1.2 m and 0.5 m diameter, on parallel shafts 4 m apart. The mass of the belt is 0.9 kg/m length and the maximum tension is not to exceed 2000 N. The coefficient of friction is 0.3. The 1.2 m pulley, which is the driver, runs at 200 rpm Due to belt slip on one of the pulleys, the velocity of the driven shaft is only 450 rpm Calculate the torque on each of the two shafts, the power transmitted, and power lost in friction. What is the efficiency of the drive?
8. Draw an epicyclic gear train with sun and planet gear. The annular gear D has 80 internal teeth where as the sun and planet gears have 40 and 20 external teeth respectively. The gear B meshes with annular gear D and also with sun gear A. the arm E rotates about the centre of annular gear B. the gear B is carried on the arm E. if the gear D is fixed and arm rotates at 30rpm.find the speeds of gears A and B.
